THE IRON TRADE REVIEW

VOLUME XXX — CLEVELAND, O. — DECEMBER 9, 1897. — CHICAGO, ILL. — NUMBER 49

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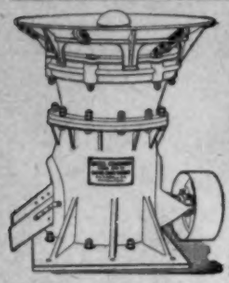

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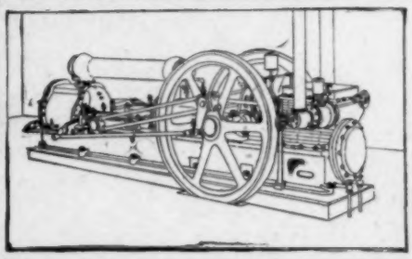

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THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. DECEMBER 9, 1897. CHICAGO, ILL. NUMBER 49

THE WEEK IN IRON CIRCLES.

The second week of December finds the iron trade still quite at sea regarding the basis for business in 1898. In all lines there is a close canvass of the situation, in view of decisions that must soon be made, since it is generally believed that with all its present quietness, the market is not far from a season of activity that might rapidly dispel much of the uncertainty that now hangs over the new year. In such a time of transition there are contradictory indications. The few buyers of foundry pig iron, for example, who have come to the point of closing in the past fortnight have found a variety of views among sellers. The predominant feeling is strong, leading Southern interests in particular, with stocks still decreasing and orders booked taking the output of the next three months, refusing offers at cut prices; yet there are variations of 50 to 75 cents in some of the quotations heard of for next year. Bessemer pig iron shows practically no movement; some of the elements of cost for 1898 are still undetermined, but labor is fixed on a higher level. For December delivery $9.50 is still asked, though $9.30 was the basis of a reported sale. Offers for January are below what furnacemen will entertain. Some activity in steel rails is noted in the week and fair sales have been made, largely by Central Western and Western mills at figures about $1 a ton above the war prices of last February. The rail mills are winding up the heaviest 12 months tonnage since the panic and find ground for believing that 1898 will be quite up to the record of 1897. Thus far no signs appear of the savage competition that marked the break of the pool. The past week has developed some structural business, one good contract coming up in the East, and the amount of work to be figured on in the early months of the new year is encouraging. The agricultural implement trade is carrying on manufacturing operations this winter on the largest scale in several years. So completely was last year's product sold out that unusual preparations are being made for a demand that seems certain to result from vastly improved farm finances. Unless the railroads and the farmers do the unexpected and the unprecedented, the iron trade will not wait long for tangible signs of a great year's business. There has been a large output in 1897 in all lines, yet the round-up will show that profits are nothing to boast of. What is expected of the new year is not only a tonnage exceeding that of 1897, but better margins, and the wage advances that have come recently will be a factor in assisting to both. The week has added nothing to the settlement of the uncertainties that surround the plans of the wire rod combination. Some of the concerns negotiated with will wait for the year's balance sheet before deciding what sort of an offer to entertain. Thus far it would appear that the promoters of the aggregation are disposed to deal liberally in the matter of appraisals; but one-third cash and two-thirds securities, instead of two-thirds cash, as at first reported, is not attractive in every instance. In other cases the personnel of the management of the combine is a matter about which certain concerns desire to be well assured. The giving out of Delaware shipyard work to local mills, last week, signifies that Pittsburg is not cutting deep to get winter business. A 4,000-ton contract in Japan is also assured to Philadelphia, and the big Dutch contract was fairly won by the same interest, though the award is not yet made. At Pittsburg there have been large inquiries the past week, particularly in billets and sheet bars, but sellers are withholding quotations on the first half in 1898. Some business in coke at $1.65 is reported and Chicago reports show that the local steel interest has extended its holdings in coke ovens and lands.

THE CLEVELAND DISTRICT.

Ore shippers promise to break the record for late cargoes this year. Though the figures showing receipts of ore at Lake Erie docks would appear in this issue, in the usual order of things, we are compelled to defer publication for one week owing to the fact that at this writing ore is still being loaded at Escanaba and the last cargoes from Two Harbors are still in Lake Superior. There are indications that some producers are straining for a tonnage record. In the case of some Mesabi properties, at least, considerable unsold ore has been shipped. As indicated in the table given elsewhere, closely approximating the actual figures, the total of shipments by water will be not far from 12,200,000 tons. All-rail shipments of last winter and of the present month may increase this beyond 12,400,000 tons. In 1896 the all-rail shipments were 290,000 tons.

Pig Iron. So far as valley furnaces are concerned the Bessemer pig iron market is at a standstill. There is some small trading through dealers' offices, and $9.30 and $9.40 in the valley are named in connection with two or three Pittsburg sales for December delivery, while $10, Pittsburg, is the market for prompt iron. Offers of $9.25, December and January, have been promptly declined by valley furnacemen. Gray forge has sold at $8.35 in the valley, yet at Pittsburg a 1,000-ton transaction was made at $9.25. Foundry iron is weaker, but there is little doing. In some cases $9.30 to $9.50 valley is reported as the basis on No. 2; other sellers again refuse to consider these prices. The coke situation has not cleared. A sale of Connellsville coke is reported at $1.65 for first quarter of 1898; in other quarters offers of $1.50 are reported by buyers. No circular has been issued, however, by the leading Connellsville interest. We quote Cleveland prices:

Bessemer	10 15	Valley Scotch No. 1	$10 75@11 00
No. 1 Strong Foundry	10 65@10 90	Valley Scotch No. 2	10 25@10 50
No. 2 Strong Foundry	10 15@10 40	Gray Forge	9 25@ 9 40
No. 3 Foundry	9 75	Lake Superior Charcoal	12 00

Finished Material. The market for rolled products has the usual December aspects. The decline in billets encourages expectations of lower prices on finished steel and the market may be expected to drift for a few weeks. Plates are 1c Pittsburg, for tank and bars have sold at .95c valley mill. Sheets are quite firmly maintained, the mills being well employed. In wire rods there is some inquiry and Central Western mills are disposed to hold to $22.50 to $23. Wire is a trifle firmer at $1.15 to $1.20; wire nails are quoted $1.35 by some mills, while others name $1.40. In pipe and tubes there are reports of occasional cuts in price, though these have not been enought as yet to disrupt the agreement. Old material, in line with bars and other mill products, is weaker. We quote old steel rails at $10 and old iron rails at $13 to $13.50; No. 1 railroad wrought scrap, $10.50.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1142 MONADNOCK BLOCK, Dec. 8.

While there are no conditions locally that indicate any weakness in the market, buyers are disposed to think that the slight weakness in the Eastern markets will have its effect here, and are consequently not as anxious to place their orders for long deliveries as they might otherwise be. Mill and furnace men, however, are inclined to the belief that prices will be little if any lower than they are at present, and that there is a possibility of an advance in most grades of iron and steel shortly after the turn of the year. Meanwhile, not much business is being closed, and it is not likely that any large tonnage will be sold before the first of the year. The report current, that the Illinois Steel Co., which has owned about six-sevenths of the Southwest Connellsville Coke Co. for a long time, has lately acquired the remaining interest, while not officially confirmed, is undoubtedly correct. This will give the Illinois Steel Co. the entire output of the Southwest company's 1,210 ovens, and will make it that much more independent in the matter of fuel supply.

PIG IRON.—There has been about as much business closed in the week as in the week previous, but the demand does not seem to increase at all, and furnaces are not looking for a great deal more business between now and Jan. 1. The largest sale of the week was of 1,500 tons of Northern iron, and the local furnaces secured the bulk of the week's business. Prices are fully as firm as they were a week ago, although there is a disposition on the part of the buyers to think they will be lower before the end of the month. No concessions have been made by the furnaces thus far. We have reduced our quotations on local irons slightly:

Lake Sup. Charcoal	$12 50@13 00	South'n Coke No. 3	$10 35@10 60
Local Coke Fdy. No. 1	11 00@11 50	Southern No. 1 Soft	11 00@11 25
Local Coke Fdy. No. 2	10 50@11 00	Southern No. 2 Soft	10 60@10 85
Local Coke Fdy. No. 3	10 25@10 50	South'n Silveries	11 25@11 50
Local Scotch Fdy. No. 1	11 50@12 00	Jackson Co. Silveries	12 50@14 50
Local Scotch Fdy. No. 2	11 00@11 50	Ohio Strong Softeners	12 00@12 25
Local Scotch Fdy. No. 3	10 50@11 00	Alabama Car Wheel	16 00@17 00
South'n Coke No. 1	11 00@11 25	Malleable Bessemer	10 75@11 00
South'n Coke No. 2	10 60@10 85	Coke Bessemer	11 50@12 00

BARS.—There continues to be a steady demand for bar iron and steel, and sales of a good tonnage were made last week. Prices are firm, and are made at 1.10c to 1.15c for common iron, 1.20c to 1.25c for guaranteed, and 1.20c to 1.25c for soft steel bars from strictly billet stock.

CAR ORDERS.—No large orders have been placed for cars in the week. There is still a good demand for car material, and the Western roads are figuring on business which will bring a large tonnage into the market soon after the first of the year.

RAILS AND TRACK SUPPLIES.—The local mills report small sales and not much prospect of closing a large business before the first of next year. It is thought, however, that the tonnage for next year will be fully as large as this year's if not larger. Prices are as follows: Rails, $19 to $20.50, according to specifications; steel splice bars, 1.20c to 1.30c; track bolts, with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.60c to 1.65c.

BILLETS AND RODS.—No sales of billets or rods are reported by the local mills. Quotations are nominally $17 for billets and $24.50 for rods.

STRUCTURAL MATERIAL.—No large contracts were closed last week, but general business in small lots was quite good. There is some weakness noticeable in prices, but ordinary quotations have not been changed as yet. They are as follows: Beams, 15-inch and under, 1.30c to 1.35c; 18, 20 and 24-inch, 1.40c to 1.45c; angles, 1.20c to 1.25c; plates, 1.15c to 1.20c; tees, 1.30c to 1.40c. Small lots from stock are quoted at one-quarter to one-half cent higher.

PLATES.—Orders have not been large, but a good many small sales bring the week's tonnage up to a good total. A sale of 1,000 tons of tank steel is reported. Quotations are a little lower, and are made as follows: Tank steel, 1.15c to 1.20c; flange steel, 1.25c to 1.35c; firebox steel, 1.85c to 5c.

SHEETS.—Business has been quite good, but not as large as in the week previous. The demand is only moderate and sales are not expected to be as large in the balance of this month. Quotations are made at 2.20c to 2.25c for No. 27 black and 80 and 5 to 80 and ½ per cent discount for galvanized.

MERCHANT STEEL.—There is still a good demand, and sales last week were fully as large as were those of the week before. The larger part of the business coming in now is in small lots from store. Prices follow: Open-hearth spring, tire and machinery steel, 1.65c to 1.75c; smooth finished machinery steel, 1.60c to 1.65c; smooth finished tire, 1.45c to 1.50c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

SCRAP.—Sales of all kinds of scrap were small last week and are not expected to be any larger before January. Prices are inclined to weakness, although no changes have been made. Dealers' selling prices are as follows:

Old iron rails, gross	$12 00@$12 50	Axles, net	$14 00@$14 25
Old steel rails, long, gr.	10 50@ 11 00	Cast borings, net	4 00@ 4 25
Old steel rails, short	9 00@ 9 25	Wrought turnings, net	5 50@ 6 00
Old wheels, gross	10 50@ 11 25	Axle turnings, net	7 25@ 7 50
Railroad forge, net	11 75@ 12 00	Mixed steel, gross	7 00
Dealer's forge, net	9 00@ 9 50	Stove plates, net	6 00@ 6 25
No. 1 mill, net	8 00@ 8 50	Heavy melting steel gr.	8 00@ 8 25
Heavy cast, net	7 75@ 8 25	Old iron splice b., net	13 25@ 13 75
Malleable cast, net	9 00@ 9 25		

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
807 TRADESMEN'S BUILDING, Dec. 8.

Inquiries for next year are heavy. Billets, sheets, bars and rods and, in finished material, light sheets and structural material have been inquired for but, with the exception of structural steel quotations are not given. For this year all prices are weaker, odd lots in middle hands bringing out low quotations. Rails have been selling for 1898 during the week, several good contracts being booked. The decision of the Joint Traffic Association to restore fourth and fifth-class rates on Jan. 1 has not affected quotations, as the meeting next week is expected to modify this decision.

PIG IRON.—The Bessemer market is quoted at $9.40 and $9.50 valley, but middlemen have attempted to dispose of odd stocks at lower prices without success. There is in reality no market for Bessemer and efforts to sell only depress prices more. Some of the low iron offered calls for deliveries into next year but such offers are not from furnacemen. Coke sales are reported in the valleys at $1.65 for three months of 1898, though not by the leading Connellsville interest. Gray forge while weak is not as low as some reports indicate. A sale this week at $9.25 buyer's mill, Pittsburg, represents the market for this year's delivery. There has been no buying of foundry irons except in small lots. Quotations are made as follows:

Bessemer, valley	$ 9.50
Bessemer delivered Pittsburg District,	10.00
No. 1 Foundry	10.75 to 10.90
No. 2 Foundry	10.25 to 10.40
No. 3 Foundry	10.00
Gray Forge,	9 25

BILLETS.—There is heavy inquiry for billets for next year from all quarters, particularly the West, and so far there is little inclination to quote. For this month steel is much weaker, owing to several lots now being offered which must be moved before Jan. 1. The market is quoted at $15, but steel has been offered for this year somewhat lower. Sheet bar shipments are easier and prices are down slightly—$17 and $17.25 being quoted. Inquiry for both sheet bars and rods for next year is heavy and the latter are being held at $23 pending developments concerning the wire combination.

STRUCTURAL MATERIAL.—Each week now develops new work to be put through early in next year, on which estimates are wanted. Inquiries of this sort last week were much heavier and have improved the outlook for 1898. A new office building in New York will take 5,000 tons and will be let before Jan. 1st. Locally the East End Market House is at the bidding stage. Mills are quoting beams and channels, 15 inches and smaller, 1.10c; 18 to 24 inches, 1.20c; angles, 1.10c; universal plates, 1.05c; tees, 1.20c; zees, 1.10c.

SPELTER.—Prices on spelter are temporarily stationary, Western grades being quoted at $3.75 and $3.80, Pittsburg.

PLATES.—The active plate inquiry of two weeks ago has subsided and orders are largely on contract. Tank is quoted at 1c; shell, 1.10c; flange, 1.15c.

FERRO MANGANESE.—Ferro-manganese, domestic 80 per cent, is quoted at $47 and $47.50.

PIPES AND TUBES.—There is a further weakness in merchant pipe and in some quarters mills are believed to be running very close to the end of order books. The decline in prices of merchant pipe has amounted in recent transactions to a 5 per cent discount from the agreed rate. Lap-weld pipe is strong and boiler tubes continue in good demand. Oil country goods are weaker in the last ten days. We quote the scheduled dis-

counts as follows: Butt weld black, 72 per cent off; lap weld black, 78 per cent off; butt weld galvanized, 67 per cent off; lap weld galvanized, 70 per cent off. The second discount is 10 per cent on car load lots. Discounts on merchant boiler tubes are as follows: 2¼-inch and smaller, 72½ per cent off; 2½-inch and larger, 75 per cent. off.

Rails and Track Material.— Selling of rails has begun for 1898 but with no outward contest over prices. The local mill has made sales during the week and other lots are pending. Quotations are $18 and $19, according to section. On track material we quote: Iron track bolts, 1.65c to 1.70c; steel spikes, 1.45c to 1.55c; splice bars, 1.10c to 1.15c; links and pins, 1.15c to 1.20c.

Bars.—Steel bars are selling below 1c in competitive business and .95c is reported on recent business. Orders are light except on contract—the latter holding up well. Bar iron, both in the valleys and in Pittsburg, is doing nothing and is also quoted below 1c valley. All-muck branded bar is quoted at 1.30c, Pittsburg.

Iron and Steel Skelp.—The demand for skelp is light—sales occurring only in small lots. Quotations are made as follows: Grooved steel skelp, .95c to .97½c; sheared steel skelp, 1.02½c to 1.05c; grooved iron skelp, 1.10c to 1.12½c; sheared iron skelp, 1.17½c to 1.20c.

Sheets.—There has been heavy inquiry during the week for light sheets and few of the lots wanted have been secured. One local interest reports inquiries aggregating 4,000 tons and no quotations were made in response. Both mills and dealers are undecided as to the future and a break in some direction seems not improbable in the next few days. For this year deliveries are easier and No. 28 for late December delivery are offered at 2.05c. Galvanized are still active at 80 and 5 per cent. off list. Black plates for tinning are quoted at 2.30c and 2.35c.

Old Material.—On compulsory sales old steel rails have gone in the week at $10.25 and old iron rails at $13.25. Neither is in any demand. Under similar conditions No. 1 wrought scrap sold at $10.10 net and cast scrap at $9.50 gross.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Cincinnati. The encouraging feature of the iron market during the past week has been the urgent call for shipments on old orders and the pressure for early delivery, especially to points reached by water. A late closing of navigation in the East will be of special benefit to buyers whose wants are greater than anticipated and who are now trying to get in their winter's supply. A like urgency exists to a large extent to points reached all rail, indicating that consumption is holding up remarkably well considering the season. An easier condition exists in the Alabama district regarding car supply, and it is expected that stocks of iron there will show a decrease during November. The inquiry for iron is very restricted, although a few large buyers are testing the market. It looks now as if the waiting spell would continue, but the time is rapidly approaching when contracts must be made, and orders may come freely the latter part of this month or first of January. The car situation has not improved any in the Pocahontas region, and this large producing center of furnace and foundry coke is totally unable to supply the demand, for lack of cars. It is clearly evident that many of the railroads will be forced to equip themselves within the next few months to take care of their traffic. We quote for cash f.o.b. Cincinnati: Southern coke, No. 1 foundry, $10; No. 2, $9.75; No. 3, $9.45; gray forge, $9.25; mottled, $9; No. 1 soft, $10; No. 2, $9.75; Hanging Rock charcoal, No. 1, $14.50 to $15.50; Tennessee charcoal, No. 1, $12.50 to $13; Jackson Co. silvery, No. 1, $12.50 to $13; Standard Georgia car wheel, $14.25 to $15.

Buffalo. There have been practically no changes in the condition of the pig iron market during the past week. Furnaces supplying this territory are still very busy rushing forward shipments on contracts already entered. Inventory time is close and foundries are already cutting down stocks of iron on hand and it is surprising, in view of this fact, that furnaces should be so pressed for shipments. While no large orders have been entered, the run of smaller contracts has been satisfactory. Indications are that the usually dull month of December will be up to the average of previous years. This, taken together with the sold-up condition of furnaces in this district, gives a strong undertone to the market and adds strength to the arguments of buyers who believe there will be higher figures in iron early next year. We quote below on the cash basis f.o.b. cars Buffalo: No. 1 strong foundry coke iron, $11.25; No. 2, $10.75; Ohio strong softener, No. 1, $11.75; No. 2, $11.25; Jackson Co. silvery, No. 1, $14; Southern soft, No. 1, $11.75; No. 2, $11.35.

THE FOUNDRYMEN'S ASSOCIATION.

The December meeting of the Foundrymen's Association was held at the Manufacturers' Club, Philadelphia, Wednesday evening, Dec. 1st, with President Wanner, of the Reading Foundry Co., in the chair. Among those present were the following: Chas. Baker, Thomas-Roberts-Stevenson Co., Philadelphia; Robert Seitz, A. B. Farquhar Co., Ltd., York, Pa.; Geo. C. Davies, Pilling & Crane, Philadelphia; T. B. Harkins, T. B. Harkins Foundry Co., Bristol, Pa.; Thos. Pole, Bement, Miles & Co.; Arthur Howe, Chas. Riceman, I. P. Morris Co., Philadelphia; Jas. S. Stirling, Harlan & Hollingsworth Co., Wilmington, Del.; W. F. Sauter, G. Rebmann & Co., Philadelphia; Alfred Green, Vulcan Works Chester, Pa.; Rob't Liddell, J. Thompson & Co., Philadelphia; H. B. Taylor, Pettinos Bros., Bethlehem, Pa.; F. A. Riehle, Riehle Bros. Testing Machine Co.; Steven C. Collins, Geo. V. Cresson Co.; Asa W. Whitney, Geo. C. Davis, Thos. Devlin & Co., Philadelphia; Jas. R. Mills, Jr., *The Iron Trade Review*, Pittsburg; J. H. Pepper, *Iron Age;* W. C. Henderson, New England Steel Casting Co.; Howard Evans, J. W. Paxson Co., Philadelphia.

The executive committee reported as follows: "This meeting finds us in the last month of the year, when we had expected every foundry in the land would have all it could do running six days per week. As a matter of fact, we find there is a great improvement over this time last year, and while there is room for further improvement, the output of the foundries in general is very much better than it has been at any time during this year. This, of course, is more satisfactory; but the trouble still is that prices are exceedingly low and we do not see that this condition of affairs can be bettered until the foundries are filled up with work, when they can afford to ask better prices for new contracts. In other words, supply and demand have much to do with business in general. It looks as though the supply was greater than the demand, but this great and prosperous country is growing very fast and it seems that the near future will bring with it a better demand and at better prices. We know of a large number of foundries that have about all they can do, some of them having enough work to run their shops full for six months, while others are doing a hand-to-mouth business that is not at all satisfactory. But as a rule we can see a great improvement over the past year. To-night we have no set paper, and the attention of the meeting is called to discussions on topics of interest to foundrymen leading up to economical productions. We think the thought expressed by our president at the last meeting, inviting the proprietors of the different foundries to bring with them their superintendents and foremen to the meetings, is a good one and will enable those acting on it to pick up information of value to the plants which they represent."

The responses by the members present to the secretary's inquiry about trade conditions were in the main encouraging and showed more work and longer hours than a year ago. In almost every case, however, prices were reported to be but little if any above last year.

The discussion was of an informal and general nature, the important matters touched upon being the export trade, sand blast and general cupola practice. On exports the expressions of members were to the effect that foreign countries are taking steps to shut out American products. Instances were cited where ineffectual attempts had been made by foreign manufacturers to have certain home contracts awarded them at prices above American bids. The reports showed no cessation of efforts to follow up the trade already won nor any inclination to succumb to obstructions. The chief danger, as indicated by the president, lay in the temptation of higher domestic prices.

The discussion of the sand blast brought out expressions generally favorable to this method of cleaning castings, although failures were cited in some instances.

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THE AMERICAN INVASION OF ENGLAND.

While thus far the exports of American iron and steel and machinery to Great Britain have reached no proportions calculated to create anxiety for the immediate future of competing industries there, it is certain that the tone of much that is written in England on this subject has all the evidences of deep-seated alarm. In introducing an article written especially to emphasize the necessity of a decided reduction in the cost of blast furnace coke by the employment of by-product ovens in England, the London *Iron and Coal Trades Review* makes this unusual admission of what is mildly called British conservatism:

> The general use of higher temperatures in the blast furnace and the employment of high pressures of blast, whereby the American iron smelters have been enabled to secure outputs that put the best achievements of British works entirely in the shade; the slow progress made by the basic process of steel manufacture, despite our possession of enormous supplies of phosphoric ores; the hesitation generally shown in adapting our industrial establishments to methods calculated to get a greater average yield out of a given plant; the continued use in a great many cases of obsolete plant and appliances, despite the adoption of much more modern plants by our most formidable competitors; the comparative patience with which we allow ourselves to pay much higher transportation charges than are found in any other industrial nation; and last, but not least, the slow growth of by-product coke ovens, despite their proved economy—are al evidences of a conservatism in industrial affairs which appears to err on the side of undue caution or of slackened enterprise.

One would be led to believe, from reading some of the British criticisms of British somnolence and lack of enterprise, in the face of American aggressiveness, that it will be but a comparatively short time before many manufacturers there are hopelessly distanced in the race. Some of our over-enthusiastic prophets of conquests abroad have already pictured British manufacturers retiring in discomfiture—and at no distant day—from fields in which they have had their own way for a century and a half. We certainly believe that if prices are practically on to-day's basis in outside markets, the products of American furnaces, mills and shops are bound to find sale in competition with those from the United Kingdom; and that in England, probably to an increasing extent, American products will find a market. But it would appear that in some of the hasty generalizations on the subject, inspired by patriotism, rather than by calm judgment, the flight of the British producer from the field has been made quite too precipitate.

It is a misconception of the British character that prophesies capitulation following a mere skirmish. With all that is said about adherence to old ways, it is not supposable that our competitors in England will go passively on and permit the capture of a business that has been built up in decades of nurturing. What American practice has accomplished, and how it has been done, is not a sealed book. The appliances and the methods of blast furnace and steel works practice; the steel car and the long train, with its high percentage of live weight—these and other features of recent economies in the United States may be introduced in Great Britain, and doubtless will be introduced when the conviction becomes general that American competition must be fought with its own weapons. The natural advantages of the United States—unequaled supplies of cheap ores and of low-priced fuel—cannot be copied; but what the accumulated resources of generations can command will surely not be left untried in a struggle that has so much at stake.

It is to be considered that the leading steel plants of the United Kingdom have made more than average profits in the past two years. They know quite well, moreover, that the American iron trade has not been profitable in the same period; that the steel rail war of 1897 means several millions less in the receipts of American rail mills. It is not altogether surprising that in the midst of their prosperity, and in the belief that American iron and steel manufacturers must raise their prices of 1897 before they can make money, the iron masters across the water have not hurried the work of tearing down their plants and reconstructing on the American model. Yet where on the globe is money plentier for such an undertaking, and who believes that it will not be forthcoming, when it appears that American iron and steel are to be pushed for an increasing consumption on English ground? Articles like that from which we have quoted above are to be taken, not as proof that the American producer will have an easy victory, but only as an indication that what the British manufacturer needs most is an appreciation of American advantages and of his own shortcomings. When that comes to him, we shall expect to see a programme of resistance that has not been reckoned on by some of our export enthusiasts.

British labor, rather than British capital, will be in the way of such adaptation to the new conditions as will enable the United Kingdom to hold its ground. We make due allowance for the pendency of the struggle in the engineering trade, in reading what has been said by and for British manufacturers concerning trades union handicaps, in the past few months. No doubt the confessions of American superiority have been freer and readier than would

have come under ordinary circumstances. British pride has not been allowed to stand in the way, when it was found necessary to impress British workmen with the disaster sure to come through American competition, if they were not more pliant. But there is testimony, apart from that lately drawn out by the engineering controversy, to the ingrained opposition of English workmen to innovations, particularly those calculated to yield their employer larger returns on the same or smaller outlay for labor. On this point Hiram S. Maxim makes some very instructive observations in a recent contribution to the *Engineering Magazine* under the title, "National Differences in Labor-Handling Methods." Among other illustrations of the obstructive and injurious influence of British trade-unionism he gives the following:

Some years ago, finding that the brass-working lathes usually employed in England were of a very poor quality, I purchased some high-class lathes in Boston. Though these lathes cost five times as much as the English lathes, the output remained the same. On several occasions I attempted to show the workmen how to use these lathes,—how to take advantage of the many appliances and adjustments provided for the purpose of turning out accurate work quickly,—but all in vain. One day, however, I went to the forge myself, forged out a set of tools, tempered and ground them, and did some of the work myself. This I regarded as a practical demonstration. I proved to the men that, by having proper tools, and taking advantage of the various stops and appliances for duplicating work, I could turn out from six to ten times as much as they had been doing. The man whose lathe I had used thanked me very much, and the next day I saw he was doing quite as well as I had been doing myself. However, at the end of a month he had completely relapsed into his old ways. All the tools which I had made had disappeared, and the output was identically what it would have been if it had been done on a cheap English lathe. Other men were tried, but always with the same result. Absolutely no advantage was to be derived from the use of the new lathe. At first it appeared to me that it was negligence or stupidity, but afterwards I learned that the trade union had remonstrated with the workman, and cautioned him against doing so much work. "If Maxim wants more work done, why does he not get more men?"

The problem presented by its trade-unionism is far more serious to Great Britain than that growing out of the conservatism of its manufacturers, to which our first quotation refers. We may look to see capital there assume the defensive, and offensive, as well, when it is convinced that the American campaign is not a temporary phase of our convalescence from depression; but greater struggles with labor than have yet been seen are likely to come, in the effort to put the British industrial system on a war footing against the United States.

The following are the new officers elected at the meeting of the American Society of Mechanical Engineers in New York last week: President, Charles Wallace Hunt, New York; vice-presidents, E. S. Cramp, Philadelphia; S. T. Wellman, Cleveland; J. F. Durfee, New York; John C. Kafer, New York; David R. Fraser, Chicago, and Walter S. Russell, Detroit; managers, Norman C. Stiles, Watertown, N. Y.; E. D. Meier, St. Louis; George W. Dickie, San Francisco; H. S. Haines, Atlanta, Ga.; Gus C. Henning, New York; A. Wells Robinson, Milwaukee; James B. Stanwood, Cincinnati; Henry H. Suplee, Philadelphia, and George Richmond, New York; treasurer, Major William H. Wiley, New York.

At West Middlesex, Pa., the sale of the Ella Furnace has been ordered by court, to perfect title. After the sale the furnace will go in blast.

LAKE SUPERIOR IRON MINES.

Owing to the fact that ore shipments are still being made at Escanaba and that a few cargoes from the head of the lake are yet on the water, the ore movement by ports cannot be given except by approximation. Between Nov. 1 and the close of the season, all upper lake ports except Escanaba shipped 648,403 tons. Closely estimating Escanaba, using official figures for the other ports, we get the following exhibit for the season's work. The probabilities are that the figures given will be slightly exceeded:

	Gross Tons.
Marquette	1,945,519
Ashland	2,067,637
Gladstone	341,014
Duluth	2,376,064
Two Harbors	2,650,750
Superior	531,800
Escanaba	about 2,298,000
Total	12,210,784

The Ishpeming, Mich,. branch of the Mine Workers' Union served notice, through its officers, upon the three local mining companies that an advance of 15 per cent in wages was expected by Dec. 15. The mining companies have been figuring for some time on a new schedule, which advances wages, and expected to put it in operation some time this month. The officers of the miners' union, evidently knowing this to be the case, and desiring to have the advance seem to the men to come as a result of their prodding, have sent the notice referred to. Many of the union miners have said that they had no knowledge that the demand was to be made. It is only a few weeks ago that a similar demand was made, but the mining companies paid no attention to it, because they have determined not to treat with the self-assuming agitators who claim to be the mouthpieces of the men. The amount of the advance that is to be made is not stated, but the mining companies have recognized all along that as soon as this year's contracts were out of the way a higher basis of wages should be arranged.

At the Franklin mine on the Mesabi range, there is a stockpile of 40,000 tons, which has been on the ground for about a year. About 30,000 tons have been shipped the past season, but no ore has been mined.

The earnings of the Duluth & Iron Range Railroad, both in gross and net, for the year ending Dec. 31, will exceed those for 1896, and are the largest in the history of the company. The ore hauled in 1897 amounts to 2,650,750 tons. For the new line surveyed over the summit from Two Harbors 3,000 tons of 100-lb. rails have been bought.

The Minnesota Iron Co. is beginning the development of a considerable find of ore in section 13, 58–17, on the Mesabi range, not far from the Roberts location. It is expected to become an important property.

Test pitting work at the Oliver mine is reported to have shown ore averaging better than the output of the past season.

At the Ohio mine stripping has been resumed by the Consolidated Co. and it is probable operations will be on a considerably larger scale next year.

The Pewabic has shipped about 280,000 tons the past season. At the pit from which lean ore is to be taken for concentration in the plant being erected by the company, mining operations have begun.

The Mesabi properties of the Oliver Mining Co. are under the general superintendence of J. D. Gilchrist. At the Mountain Iron, shipping is still vigorously pushed with three steam shovels.

Since the strike at the Bellaire Steel Co.'s plant was declared off, the old men have made application for work. Some were re-employed but other, whose sudden departure from their posts seriously interfered with operations, were not accepted. The plant is now on in full.

At the Edgar Thomson steel works, on the night of Dec. 5, a 12-hour turn in the converter building gave 99 "blows," as against 95 as the highest record previously made. At the Cambria Iron Co.'s Bessemer plant a record of 94 heats was made recently.

The Shiawassee Iron & Engine Works, Owosso, Mich., have started their new foundry.

THE ANDREW DRILLING DEVICES.

The illustrations show the patent taper shank twist drill and the drill socket, which M. L. Andrew of Cincinnati manufactures under his patents. Both represent an important advance in the manufacture of drilling tools. The twist drill has a patent reverse inclined groove milled in the shank. Fig. 2 shows a section of the drill shank. A steel key fits into the groove milled in the shank, doing away with the old flat tang on taper shank tools, and removing the cheif cause of the breakage of drill shanks. The socket shown in Fig. 2 holds a taper shank tool with perfect rigidity for upper cutting or under cutting and will not mark or bruise the shank. Drills may be completely worn out without injury to the shank. Another desideratum supplied is assurance against the dropping out of tools from the socket. It is not necessary to make any change from the old system of straight and taper shank tools, as old taper shank tools with the tang broken off may be used just as well as new tools. The manufacturers are M. L. Andrew & Co., 59-61 Elm st., Cincinnati. The Andrew chuck and drill have been commended by the Committee on Science and Arts of the Franklin Institute, and have been adopted for use by many mechanical experts.

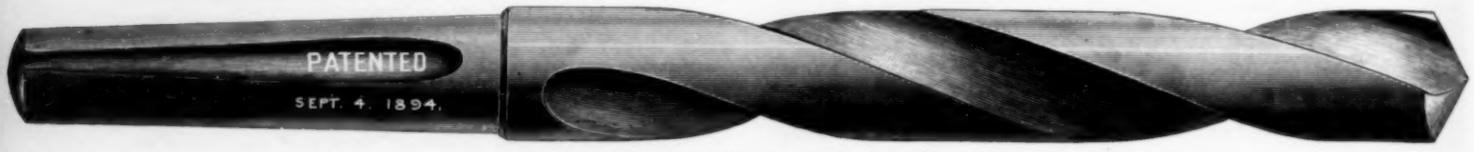


FIG. 1.—THE ANDREW TAPER SHANK TWIST DRILL.

Western Foundrymen's Association.

The next regular meeting of the Western Foundrymen's Association will be held at the Great Northern Hotel, Chicago, at 7:30 P. M., Dec. 15. A paper by W. N. Moore, entitled "A Method of Obtaining Weekly Shop Costs," will be read. The paper on "Molding Sand" by D. H. Truesdale, which was read at the Cincinnati meeting, will be further d scussed. In order to make this discussion as interesting as possible, it is desired that members submit in writing any comments or criticisms on these papers they may care to make, or reports of their own experience. The following amendment to the by-laws is to be discussed and voted upon at this meeting: Article V., Section 1: Substitute the word "plurality" for the word "majority." Members are also requested to submit questions relating to any phase of foundry practice that they may desire discussed by the association, and reports of experience or phenomena in their daily work, for discussion at future meetings.

A DEED for coal lands in Westmoreland, Fayette, Allegheny and Lawrence counties, from C. L. Painter and others to the Isabella Furnace Co., amounting to $1,100,000, has just been recorded at Greenburg, Pa. The coal in Westmoreland county lies principally in Derry Township and around Cokeville, where the Isabella coke works are situated. The company owns extensive plants at New Castle, Lawrence county, and at Etna, Alleghany county.

The first of the calendars for 1898 to put in an appearance is from Rogers, Brown & Co., the pig iron merchants, and is quite up to their usual standard. It is artistically printed in striking colors, and is well calculated to attract attention.

THE TIN PLATE MARKET.

The past week has developed considerable weakness in the tin plate market, and sellers show more desire to meet buyers' views than formerly. Yet comparatively little business has resulted and the complete stagnation that has followed the completion of the canning season still continues. The only thing that has saved the market from utter demoralization is the fact that the mills are well supplied with orders for December and January and the old business in hand will thus carry them through the dull winter months. The fact that few contracts for next year have been made and that few of the large buyers seem willing to take hold even at the concessions sellers are now willing to make, has had its effect in making the market fully five cents a box weaker than it was in the middle of November. The prices that are being made for the first three months of 1898 represent lower net prices at maker's mill than ever have been made in the history of the trade. These exceptionally low prices sellers claim, however, cannot be taken as determining the market, being occasioned by some particular seller's anxiety to fill his order book for January, February, or perhaps March.

Some business has been done, it is reported, at a price that would be under $2.80 for 100 lb. plates f. o. b. maker's mill, while the general quotation is fully five cents higher. We quote f. o. b. mill Pittsburg and Indiana districts, as follows:

CHARCOAL TINS.

	IC	IX
Lisvane Grade,	$3.45	$4.20
Calland Grade,	3.65	4.35

COKE TINS.

IC, 108 lb. Basis weight,	$2.95
100 lb. " "	2.85
95 lb. " "	2.80
90 lb. " "	2.75
85 lb. " "	2.70
80 lb. " "	2.65

TERNE PLATES.

IC, 216 lb., 20 x 28	$5.95
200 lb. "	5.65

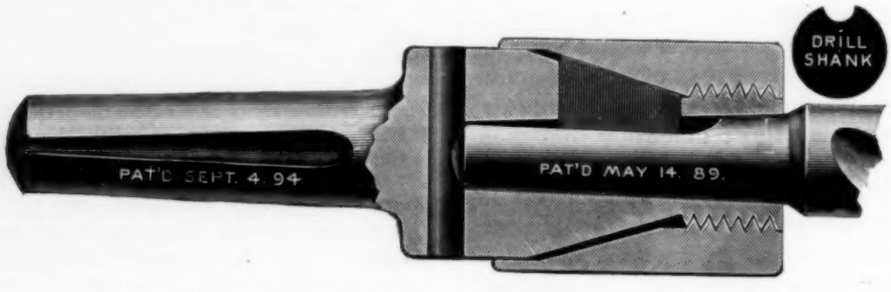


FIG. 2.—THE ANDREW TAPER SHANK DRILL SOCKET.

An American Structural Firm the Lowest Bidder.

The A. & P. Roberts Co., of Philadelphia, operating the Pencoyd Iron Works, has a cablegram from C. C. Schneider, its engineer on the ground, saying that its bid of $474,000 is the lowest in the competition for the contract for the material and erection of an extensive bridge over the River Yssel, near Westervoor, Netherlands. The bridge is to be built for the Government of Holland. The next lowest bid was $487,000. Leading structural and bridge building concerns in England and Belgium were competitors. There is an intimation that a strong effort will be made by European bidders to keep the work from going to the United States. General Manager Swank, of the American Iron and Steel Association, has written Secretary of State Sherman asking that the U. S. minister at The Hague use his influence in protecting the interests of the American bidder. The A. & P. Roberts Co. has just closed a contract for 4,000 tons of bridge work on the Imperial Railroad of Japan.

CAST IRON UNDER IMPACT.

At the meeting of the American Society of Mechanical Engineers in New York last week a paper was preseted by W. J. Keep, of Detroit, under the title "Cast Iron Under Impact." These statements are made at the outset: "The object of the experiments described in this paper was to determine the influence of shock upon cast iron. They incidentally show the use of mechanical analyses in determining the cause of physical changes which take place in cast iron. The kind of shock considered is a blow, not sufficient to produce distortion of the test bar. Test bars were also subjected to shock by tumbling them in a tumbling barrel." In the 28 pages that follow, Mr. Keep gives numerous tables of results, with comments upon them, each separate phase of the subject having its own sub-head. These sub-heads, which are reproduced herewith, give a running synopsis of his conclusions:

"Striking a test bar on the side or end decreases its length. Test bars tumbled in contact with other castings in a tumbling barrel increase in length. Tumbled test bars show large increase of strength. Blows delivered on the side or end of a test bar do not increase the strength. Test bars ½ inch square increase in strength until they have been tumbled two or three hours, but not materially by longer tumbling. The strength gained by tumbling is due to making the surface of the test bar smooth and to condensing the surface by peening. The removal of the surface weakens a test bar, while smoothing the surface without removing it strengthens it. Smoothing the surface by pounding with a hammer increases the strength by condensing the grain. Test bars of gray iron containing least silicon gain most by the process of milling."

In one portion of his inquiry Mr. Keep considers the question, "Are tumbled castings annealed?" Referring to an annealing record published by him in 1894, he says: "This record shows that annealing by heat causes a test bar to become longer. If the test bar before annealing is weak on account of brittleness, it grows stronger; but if it was not brittle annealing weakens it. Deflection is increased 35 per cent. Total carbon remains the same; most of the combined carbon is changed into graphite. All other elements remain substantially unchanged. In annealing by heat the test bar is heated nearly to fusion, and is thereby lengthened to the utmost extent and held there long enough for the carbon to change to graphite and for the crystals to rearrange themselves. When the casting cools it does not regain its former length, but is longer than before annealing.

"Tumbling reverses this process, and by pounding stretches the sides and presses apart the crystals of the inner portion of the test bar and increases its total length. It has just been proved that the increase of strength by tumbling is partly caused by a removal of the roughness on the surface of the casting and by rubbing off all notches in the corners of the test bars.

"I called the attention of Messrs. Dickman & Mackenzie, 1224 The Rookery, Chicago, to the statement of Mr. Outerbridge that chemical analysis of tumbled bars did not show any change in composition and suggested that they should find if this statement was true, and that to do so would require the most careful analytical work that could be done. Regarding the determinations Mr. McKenzie writes: 'I am frank to say that in all cases where total carbon shows an increase after tumbling, I am disposed to credit the same to the personal error of chemical analysis, since there can be no creation of carbon inthebar, but merely a rearrangement of molecular structure which should not affect the total but may affect merely the proportionate amounts of the two carbons."

Under the sub-head, "Test Bars of Gray Iron Containing Least Silicon Gain Most by the Process of Tumbling," Mr. Keep says: "Such iron takes a closer copy of the mold, while iron containing more silicon does not burn into the sand as much and therefore makes a smoother surface. In half-inch bars from any one mixture, up to 3.50 per cent of silicon, each increase of silicon generally adds to strength. The surface being already smoother, the proportionate gain in strength by smoothing during milling is not as great as with bars containing less silicon, which have a rougher surface to begin with. The bars which were protected, Table XI., were smoothed somewhat, but not anything like as much as when unprotected. The test bars which received 5,000 blows on the end were not smoothed, and show no gain in strength. I am not able to discover any relation between the chemical composition and the gain in strength except as it affects the roughness or the softness of the surface."

In conclusion Mr. Keep comes to a question that became familiar in the chemico-physical controversy of three years ago. In his experiments he had taken bars from an all-pig mixture, except 5 per cent of stove scrap. For 18 days the mixture had gone unchanged. The analysis of two pairs of test bars taken May 26 and May 27 showed no difference in chemical composition. Yet an untumbled bar of May 26 showed strength of 365 lbs., and an untumbled bar of May 27 went 495 lbs. The grain of the former was open and coarse, while that of the latter was fine and close. He asks the general question, based on this and similar instances: "What chemical change will account for the difference in strength between test bars not tumbled?"

Discussion.

The discussion on Mr. Keep's paper was by Wm. Kent, of New York; S. L. Kneass, of Philadelphia, and Thos. D. West, of Sharpsville, Pa. Mr. West's comments on the paper were as follows:

"On page 3 of Mr. Keep's interesting paper he says 'it is difficult to determine whether the shortening which follows an end blow is caused by general rearrangement of crystals or by an upsetting of some portion of the bar. If the latter, cast iron is upset by a very slight blow.'

"Experienced founders know that cast iron can be readily upset. Many utilize this characteristic to disguise cracks in castings. This is done not only with cast iron, but with steel as well. Castings that would have been condemned on account of cracks, could the engineer or inspector have seen them, have been closed up so neatly by means of peening that the man doing the job could not readily tell where the crack was, from appearances. It is a common thing in founding to flatten out portions of a gray iron casting. The softer the iron, the more readily this is done. The blows that shorten a piece of iron can also lengthen it, with tact in peening. Crooked castings are often straightened out by merely peening the concave surface. The two facts just cited illustrate the principle involved, permitting Mr. Keep to lengthen or shorten thin bodies of cast iron.

"The paper further says, 'If further experiment should show that the casting becomes shorter when struck with a hammer, it will in part explain the frequent cracking of castings by rapping off the gates, as in the case of a pulley with light arms. If a blow exerts this influence, we can understand the frequent change in shape of many castings.' The writer's views on this point are that the cracking of pulley castings is not due to any change in length by reason of rappings, but to the difference of proportions in castings causing unequal contraction of parts. Jarring by a blow causes the part stretched or held in union by strains to separate, thus giving cracked castings. This is often shown in changes in the temperature of the atmosphere causing castings to crack of their own accord, that had never received blows of any description.

"On page 25 Mr. Keep says: 'In half-inch bars from any one mixture, up to 3.50 per cent of silicon, each increase of silicon generally adds to strength.' If this means anything at all, it asserts that a half-inch square bar will show the strength of any or all grades of iron, in agreement with the actual results found in testing strength by tensile strain, hydraulic pressures, etc. The writer has never seen a series of tests with half-inch bars, ranging through the different grades of iron (or even in one grade alone), that showed the uniform increase in strength, from the weakest to the strongest iron, which is displayed by bars of larger size. To illustrate this more forcibly, the following table is presented:

TRANSVERSE AND TENSILE TESTS OF SPECIALTY MIXTURES.

Specialty Mixture.	Transverse Strength 1½ in. Round Bars.	Tensile Strength 1½ in. Round Bars.	Transverse Strength ½ in. Square Bars.
Gun metal	3,686 lbs.	37,100 lbs.	398 lbs.
Chill roll	2,980 "	30,100 "	265 "
Heavy machinery	2,657 "	28,676 "	395 "
Car wheel	2,553 "	23,270 "	377 "
Light machinery	1,931 "	21,120 "	454 "
Stove plate	1,798 "	17,150 "	160 "
Sash weight	1,406 "	7,135 "	167 "

"A study of this table shows that ½-inch bars are very erratic, with results quite unlike the uniformity in the increase of strength exhibited by the 1½-inch round bars. The transverse tests were obtained from bars tested 12 inches between supports. All tests here given are from solid bars and are taken from a series of 100 tests which the writer presented in a paper on specialty mixtures about two years ago to the Western Foundrymen's Association. The test bars were cast by some of our leading foundries and tested by authorities in such a manner that the figures presented can be supported as reliable. The transverse and tensile strengths of the 1½-inch round bar will be found a most excellent guide for any desiring co-efficients of strength of cast iron in its various grades as coming from practical founding. The table also exhibits what the writer claims is the most practical way to conduct a series of tests, to indicate the fitness of any size or form of a test bar to indicate most accurately the strength of cast iron. The reason for ½-inch square bars being so erratic is the fact that when such small bodies of iron are cast in green sand molds, the state of the carbon and the physical qualities are too easily affected by differences in the 'temper' of molding sands and the fluidity of the metal at the time molds are poured. We have but to refer to Mr. Keep's own paper to prove that light bodies, as of ½-inch square bars, are greatly affected by variations in the 'temper' (dampness) of sand and the fluidity of metal.

"Table 8 of the paper shows that with the same ladle of iron there are differences owing to varying fluidity of metal amounting to 65, 86 and 68 pounds in ½-inch bars possessing an average strength of 381 pounds. This means that in the pouring of two different heats, we can have an error, in recording strength, from what is really the same mixture or grade of iron, of nearly 20 per cent. Carrying this up to 1-inch square bars, should they be as erratic as ½-inch bars, we would have the same mixture or grade of an iron running 2,500 lbs. one day and 3,000 lbs. the next, presenting an error of 500 pounds from what is the actual condition. The writer knows from research that such a difference does not exist with round bars 1 inch square in area or over, and could point to experiments which he has made with variations in fluidity of metal, to prove that test bars as large as 1 inch square in area, when cast in the round form especially, show very little difference. In the square form, on account of the corners with their chill, a difference of 5 per cent in some cases may be found. At the 9th line from the bottom of page 16 Mr. Keep says: 'I have proved before that iron last poured from a ladle will make stronger test bars than the iron poured first.' The writer has found the reverse result as well as that noted by Mr. Keep, but would say that the grade of iron we are using and the size of the test specimen (on which latter depends in turn the percentage of graphitic or combined carbon) determine whether test bars are stronger or weaker with the last pour from a ladle.

"Any one who is familiar with founding knows that as a rule in the same shop, no two days will show the fluidity of the metal exactly the same, saying nothing about the great difference that must exist between different shops and which can be such as to cause a wider difference in the strength of test bars in the same mixture than Mr. Keep's figures show. Any giving this subject study can readily see the wisdom of using test bars that are least apt to be affected by changes in the fluidity of metal, whether for the records of one's own shop or for comparison with others. The evil of irregularity in the fluidity of metal, it is to be remembered, is not all that prevents small test bars correctly recording the strength of iron. When we consider that slight variations in the nature and 'temper' of molding sand are as influential in making small test bars erratic, both combined are certainly not to be ignored by any one who would adopt what is best to record most accurately the strength of cast iron.

"The writer wishes it understood that he is not questioning Mr. Keep's tests on shortening or lengthening bodies of iron or those embodying increased strength by milling (a discovery first made by Mr. A. E. Outerbridge), where test bars are used in pairs, for comparative purposes. Two bars cast together in the same flask admit of a comparison one with the other, which is impossible with bars cast from two different 'heats.' Mr. Keep's tests with ½-inch bars cast in pairs are wholly different in results from what he would imply in the statement on page 25 of his paper: 'In ½-inch bars from any one mixture, up to 3.50 per cent of silicon, each increase of silicon generally adds to strength.' The inference from this is that the ½-inch bar will correctly test the strength of cast iron for the general purpose for which test bars are used.

PERSONAL.

James F. Blair and Reed F. Blair have been admitted to the Pittsburg firm of O. M. Hartzell & Co., iron and steel factors. The business will be continued under the same name as heretofore and the present offices in the Lewis Building will be retained. Instead of removing to New Castle, as has been stated, Mr. Hartzell continues his connection at Pittsburg, but will also take the active part in the Neshannock tin plate plant that the enlarged firm permits.

Horace W. Lash formerly of the Carbon Steel Co., Pittsburg, has been elected president of the Minneapolis Rolling Mills, at Columbia Heights, near Minneapolis.

H. F. Holloway, who was for a number of years Eastern manager of the Akron Iron Co., Akron, O., has become New York representative of Jones & Laughlins, Ltd. Mr. Holloway left New York in 1895 to become president of the Akron Iron & Steel Co., the reorganization of the old company. This position he has now resigned to return to his original field.

George Baker, who has been with the Illinois Steel Co. since its formation, has been appointed assistant general sales agent of the company. J. H. Price has been made assistant secretary of the company, vice Gard Maynard, deceased. L. W. McNamee succeeds Mr. Price as auditor at the Milwaukee works, and Harry Morrison becomes assistant auditor at the South Chicago works in place of Mr. McNamee.

J. S. Unger, superintendent of the armor department, and Nevin McConnell, superintendent of the Homestead Steel Works, who returned last week from a three-months' tour of England, were given a banquet at the Hotel Duquesne, on the evening of Dec. 4, by the other superintendents at the Homestead works.

Isham Randolph, chief engineer of the Chicago Drainage Canal, delivered a lecture on the canal at Central Music Hall, Chicago, Nov. 30, under the auspices of the Western Society of Engineers.

Proposed Advance in Iron Rates Jan. 1.

Though the Central Traffic Association recommended the extension, the Joint Traffic Association has declined to extend the present fifth and sixth class rates on the iron list over the three months ending March 31. This means an increase of 15 to 20 per cent on iron articles after Jan. 1. It was fully expected that the recommendation of the Central Traffic Association committee would be adopted, but the vote was 6 to 4 in favor of it, while 7 affirmative votes are required. The present rates per 100 lbs. from the Mahoning and Shenango valleys in car lots and less than car lots are indicated in the following table:

	Present.		After Jan. 1.	
	L. C. L.	C. L.	L. C. L.	C. L.
Boston	22½	19	27½	22½
New York	20	17	23	20
Philadelphia	18	15	21½	18
Baltimore	17	14	20½	17
Chicago	16	13	19	16
Cincinnati	13	10	16	13
Louisville	16	13	19	16
East St. Louis	20½	16½	24	20½

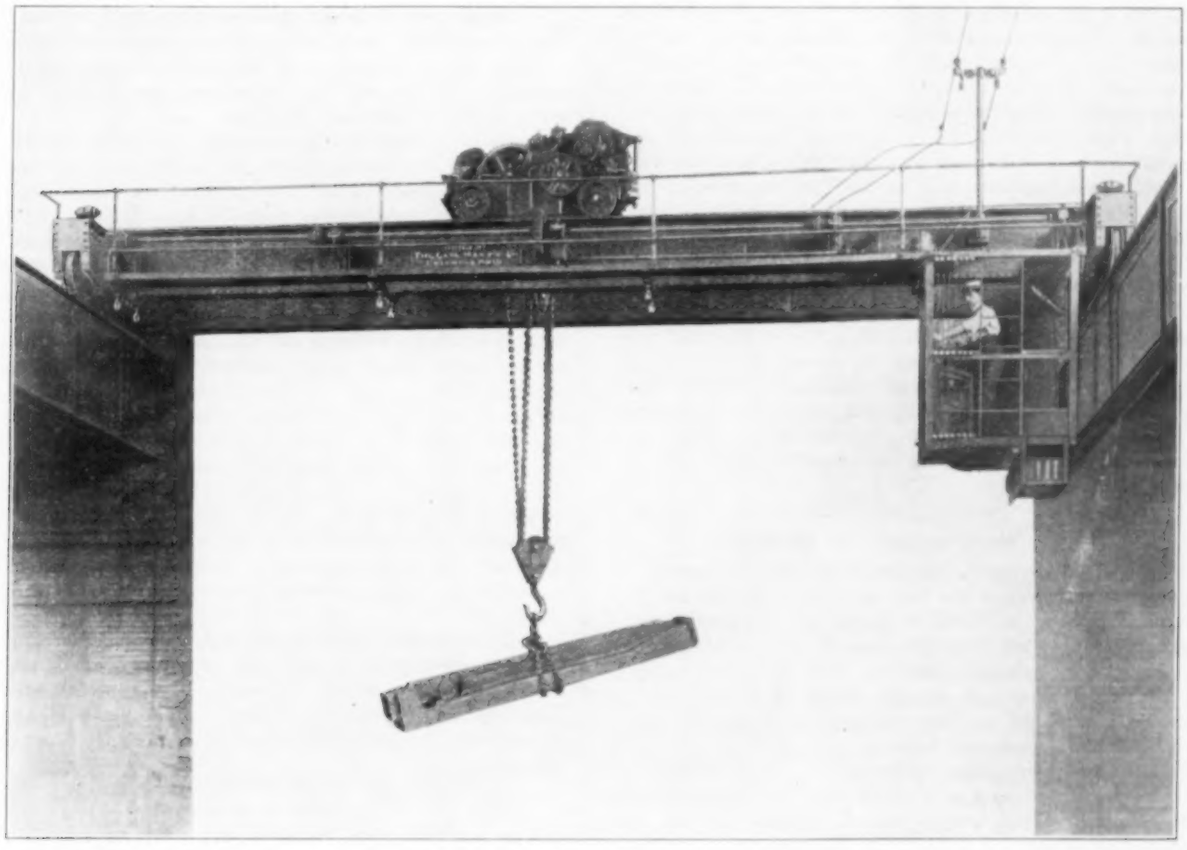
Another meeting is called for next Wednesday in New York, and it is believed the decision noted above may yet be rescinded. The central traffic committee thought that in the present demoralization of rates, it was not worth while to put back iron rates from fifth and sixth class to fourth and fifth class rates for only three months, since the summer schedule (fifth and sixth class rates) would, again go into effect April 1, in the regular order of things. The traffic managers may yet take this view of the case. On Friday of this week a meeting of the Central Traffic Association committee will be held to consider pig iron rates from the valleys and Pittsburg.

The present rates on iron articles to the East out of Pittsburg are 18 cents l.c.l., and 15 cents for car lots to New York; the proposed advance would make these 21 and 18 respectively. From Cleveland the present rates are 21 and 18 cents; proposed rates, 24 and 21 cents respectively.

TWENTY-TON ELECTRIC FOUNDRY CRANES.

It is speaking within bounds to say that during the past ten years the development of electrical machinery in connection with almost every line of manufacturing industry has done more to reduce the cost of production than any other agency. In no line has this been more conspicuous than in the operation of machinery for the handling of the product of large mills and factories. Prominent in this line is the three-motor overhead traveling crane. Without its efficiency the mammoth proportions of foundries and steel works and kindred plants would be impossible. So generally is this recognized that a foundry not provided with over-head electric cranes is now regarded as antiquated, even if built within the past four years.

The accompanying illustration shows two three-motor electric over-head traveling cranes of 40,000 pounds capacity each, as recently installed in the large foundry of the Pratt & Cady Co., Hartford, Conn. They embody several new and important features. The first to attract attention is the form of the girders, which are parallel and of even breadth throughout their entire length. That this form is scientifically correct is shown by their freedom from the vibration that has often proved so destructive in crane girders. In instances where they have been tested to double their rated lifting capacity they have shown practically no deflection. The rigid character of the connection of the main girders with the end truck frames makes it impossible for the girders to get out of square with the wheel base. The material throughout is distributed so as to procure the maximum strength with the minimum of material.



TWENTY-TON ELECTRIC FOUNDRY CRANE.

Among other features is the novel arrangement in the hoisting gear invented by W. H. Thompson, for which patents have been recently allowed. By this simple device the lifting load is made available automatically to produce a breaking action which prevents the load reversing or backing down the hoisting gear, no break to hold the load being necessary. A comparatively feeble magnetic break is used in connection with the hoisting gear only for the purpose of resisting the momentum of the motor when the current is shut off.

The bridge propelling motor is located on the side of the bridge directly over the operator's stand, this being the most favorable for the operator giving it prompt attention. For foundries especially, the location is best, as it exposes the motor to the least heat from the foundry floor, and it is further so arranged that the motor, in whole or in part, can be removed without displacing any other part of the machinery.

The hoisting gear is of the double drum type. Each chain drum is spiral grooved, right and left, the chain winding from each end of the drum at the same time toward the center. In every position of the hoisting block the chains of each drum are at the same relative angle, leaving no tendency to twist the block in hoisting or lowering the load. The gearing of the hoisting trolley is very substantial, all machine cut. Every important journal, where dispatch in making repairs is necessary, is fitted with changeable bronze bearings, removeable with the least labor. This admits of worn bearings being repaired in a few minutes. All shafting is of steel and all material the best calculated to secure durability and efficiency. Each motor is of the enclosed or dust-proof type and especially prepared for crane service and of ample capacity.

The cranes which we illustrate were built by the Case Mfg. Co., of Columbus, O., which manufacture all classes of cranes for factories, power houses and railroad shops.

The National Association of Manufacturers is arranging to hold its next annual meeting in New York at the Hotel Waldorf-Astoria, commencing on Jan. 25 next and continuing three days. The convention executive committee, which is in charge of the arrangements, held its first meeting last week. Chas. A. Schieren was made chairman, Augustus G. Paine treasurer and Chas. E. Locke secretary. The association was organized in Cincinnati in January, 1895, and now has enrolled as members between 1,100 and 1,200 manufacturing concerns. As noted in these columns from time to time, the association has interested itself particularly in the development of the export trade of the United States. Some foreign agencies have been established and efforts are being made constantly to make new openings for American manufactures.

Major J. F. Denniston, ex-City Treasurer of Pittsburg, is dead. At one time he was connected with Hussey, Dravo & Co., in the manufacture of steel castings in Pittsburg.

A POINT IN PIG IRON EXPORTS.

Wm. C. Herron, of Rogers, Brown & Co.'s New York office, writes as follows to the *Shareholder*, of New York, concerning the possible employment of pig iron warrants in connection with the export trade in pig iron:

"The development of the foreign demand for American pig iron is comparatively so new that it seems almost incredible that so much should have been accomplished in the exportation of American product. The business will increase and enjoy an ever widening expansion if judgment is used as to the adaptability of our irons to mix with local irons, where pig iron is made, and proper quantities and grades supplied at points where foreign irons must be depended upon exclusively. The reputation of American iron abroad has suffered somewhat from the action of a few conscienceless exporters, who have for a temporary gain sent grades below requirements and disregarded the established nomenclature. There will probably not be much repetition of such nefarious action, as the legitimate grading of the United States is being rapidly established abroad. The exporter of United States pig iron finds the American Pig Iron Storage Company's warrants at times exceedingly useful, as it occasionally occurs that the foreign demand is for grades the furnaces cannot supply at the moment for quick delivery. If warrants for the desired grades are obtainable the business is happily facilitated. This month some American No. 3 warrants held abroad were brought back by American exporters, that shipments might be made from warrant yards, as the furnaces were entirely unable to supply the grade in anything like adequate quantities and take care of domestic requirements.

"We are indisposed to believe that American pig iron manufacturers ship iron under specified grade. Their honor and reputation are at stake, and buyers, whether foreign or domestic, in these days will discover sooner or later the imposition. We have shipped during the present month to twelve foreign ports, including England, Scotland, Germany, Italy, Belgium, China, Australia and Japan, and quite a percentage of this was from warrant yard. Our Mr. Brown, who is now on the continent, finds that all our shipments have given entire satisfaction."

Cupola Work on Cylinder Mixtures.

During the discussion of the report on the best metal for locomotive cylinders, at the last meeting of the Master Mechanic's Association, Mr. G. R. Henderson, Mechanical engineer of the Norfolk & Western, showed a sample of iron used by that road for cylinder castings. The mixture consists of 20 per cent of steel (old springs, boiler scrap, etc.), 20 per cent No. 2 coke iron, and about 60 per cent of cast-iron scrap. It was said that good solid castings were got from this metal which finished better than the ordinary cast iron mixture, beside having the advantage of about 20 per cent more strength. The analysis of the sample was as follows: Silicon, 1.51; manganese, 0.33; phosphorus, 0.65; sulphur, 0.68; combined carbon, 0.62; graphite, 2.45. The *Railway Engineer* (London), in commenting upon this metal expresses a fear that iron founders would have difficulty in melting a mixture of this kind in an ordinary cupola and, for the benefit of our contemporary and perhaps some readers in this country, we have inquired of Mr. Henderson concerning this point, and find that there is no difficulty in melting. The regular charge is made up as follows:

Limestone	70 lbs.
Steel scrap	800 "
Pig iron	800 "
Cast scrap	2,400 "

A cupola of the ordinary Colliau type is used by the Norfolk & Western and a small quantity of limestone is introduced as a flux.—[Railroad Gazette.

THE question whether a factory chimney is real estate or part of the machinery of an establishment is now up in Montreal. The Montreal Street Railway Co. claims that its chimney, now assessed as real estate, is a part of the mechanical plant and therefore exempt from taxation. Of $75,000 expended on the power house, one-third was put into the chimney. The assessor seeks to count the stack as part of the real estate.

SCRAP-CARRYING AND PIG IRON VALUES.—II.*

In order to obtain some information relative to the chemical composition of a casting, its sectional area or thickness, the weight, hardness and appearance of fracture, I have asked for and received borings of 120 castings from 21 foundries scattered throughout Germany. I here express my sincere thanks to the owners of these foundries for their kindness in aiding me in this work. I have determined the silicon and manganese in these borings, that is to say, the impurities most affecting the hardness of the material. You have the data before you, and if you will examine Table I., you will find given the kind of casting, its weight, section or thickness, the kind of mold used, the manganese and silicon content, and remarks [see p. 13]. A comparison of the analyses, fracture, hardness and thickness gives us the relation of the thickness of castings to the silicon contents, as in the table below:

TABLE 2.

Castings of a thickness below			.....2-5 in.	require	2.5 to 2.8% silicon.
"	"	between	2-5 and 4-5 in.	"	2.1 to 2.3% "
"	"	"	9-10 and 1-1-5 in.	"	1.9 to 2.1% "
"	"	"	1-1-5 and 1-3-5 in.	"	1.7 to 1.9% "
"	"	of	1 3-5 in. and over	"	1.5 to 1.7% "

It is to be noted that with green sand molds the silicon contents should lean toward the upper limit, while with dry sand or loam the lower limit is to be taken. So, also, regarding the weight of castings, the heavy ones should be given the lower limit of silicon and vice versa.

Manganese should not go beyond 0.8 per cent, otherwise it would make the casting hard. It is rather strange that the manganese contents of the castings should be so high, and the reason for it probably lies in the fact that foundry pig irons have gradually gone up in their manganese contents. If we take the figures in Table II. as the basis of our discussion of the 120 samples, 13 of them must be excepted, as they deal with chilled castings. Of the remainder, we find 35 are normal regarding their silicon and manganese; 15 have a normal percentage of silicon, but are abnormally high in manganese, which accounts in some measure for their hardness. Twenty-three castings had an excess of silicon when their thickness was considered, being coarse-grained, as a consequence dark gray, soft, etc. Three samples are too high in silicon, but are hard on account of the presence of 2 per cent manganese. Nineteen samples have too little silicon. They should have had more when an account is taken of their thinness, being hard and not fit for machining. With 12 samples the analytical determinations cannot be reconciled with the appearance of the fracture.

Now, gentlemen, of the 107 castings, 95, or in other words 89 per cent, correspond to my table of normal silicon requirements; they agree relative to their chemical contents, hardness and thickness. I believe, therefore, that Table II. approximates the prevalent requirements of foundry work very closely.

(To be concluded.)

THE production of minerals and products manufactured therefrom, in Alabama, during October, as reported by the producers to Dr. Eugene A. Smith, State Geologist and secretary of the Alabama Industrial and Scientific Society, are as follows: Coal, 480,416 short tons; coke, 101,615 short tons; pig iron, 73,242 long tons; iron ore, 153,044 long tons; limestone, 51,118 long tons; bauxite, 1,181 long tons; silica, 140 short tons; building stone, 4,500 cubic feet. Total number of employes, 12,627.

THE Pennsylvania Railroad reports that the quantity of coal and coke originating on and carried over its lines east of Pittsburg and Erie for the week ending Nov. 13 was 534,977 tons, of which 410,812 tons was coal and 124,165 tons coke. Tonnage for the year has been 18,156,955 tons, compared with 16,421,932 tons in the corresponding period of 1896, an increase of 1,735,203 tons, of which 14,045,531 tons was coal, an increase of 1,012,889 tons, and 4,111,424 tons coke, an increase of 722,134 tons.

BY a boiler explosion, on Nov. 28, at the Soho Furnace, Pittsburg, now being operated by Laughlin & Co., Ltd., one man was killed and several seriously injured.

*Translated from Dr. Wuest's paper before the German Foundrymen's Association.

TABLE I.—DETERMINATIONS OF 120 CASTINGS, SHOWING RELATION OF THICKNESS TO SILICON CONTENTS.

Foundry.	Number.	CASTING.	Weight, Lbs.	Thickness, Inches.	Silicon.	Manganese.	MOLD.	REMARKS.
A	1	Pipe, 6¾ feet long	2,970	1 and 1.6	1.99	0.83	Dry sand.	Soft, normal si.
	2	Part of Machine	190	.8 and 2.4	1.63	1.06	"	" "
	3	Radiator	70	¼, 4-5 and 1-10	1.93	0.96	Green.	Somewhat hard, too much si and mn.
B	4	Bridge plate	24,200	1 to 4	1.46	1.35	Dry.	Coarse grained, tough, normal si.
	5	Roll for T-iron	37,400	22 to 40	0.42	0.98	Loam.	White, hard, can be machined.
	6	Marine engine cylinder	19,800	1.5 to 2.4	2.08	2.26	"	Fine grained, hard, too much si and mn.
	7	Armature ring	17,160	2.1 to 4	1.93	1.89	Dry.	" " " " "
	8	Steam cylinder	3,630	1 to 1.6	2.02	1.91	"	" " " " "
C	9	Cylinder	990	1.2	1.59	0.67	"	Mottled, can be machined, too little si
	10	Slide valve	55	1	1.08	0.71	"	White, " " " "
	11	Valve	165	.8 and 1.2	2.62	0.71	Green.	Dark grey, soft, too much si,
	12	Valve	121	¾ and 1¼	1.92	0.84	"	" " " normal si.
D	13	Hydraulic columns	4,400—11,000	1.2, 4.8, 2.4	1.29	1.14	"	Fine grained, a little hard, normal si.
	14	Bed plates	22,000—66,000	2, 4.8–8, 1.2	1.06	0.70	"	Coarse grained, soft, too much si.
	15	Locomotive cylinders	1,320— 4,400	1, 2, ¾	1.55	0.91	Dry.	Fine grained, hard, too little si.
	16	Looms	½← 110	½, 2 5, 1-5	2.49	1.00	Green.	Soft, dark grey.
	17	Steam cylinders	2,200—33,000	1.6, 2.4, 1.2	1.75	0.84	Dry.	Light, a little hard but good.
	18	Compressors	110— 1,100	.6, 1.6, .8	1.72	0.82	"	Fine grained, hard, too little si.
E	19	Column	5,170	⅝	1.80	0.69	"	Soft, silicon questionable.
	20	Base for column	120	2	1.68	0.56	Green.	" silicon normal.
	21	Base for column	960	2.4	1.43	1.09	"	" "
	22	Locomotive cylinder	2,550	1.6	2.51	0.56	Dry.	Silicon questionable.
	23	Water main fitting	30	½	2.54	0.50	Green.	Hard, normal si.
	24	Tee for water main	22	⅓	2.00	0.72	"	Hard, too little si.
F	25	Chilled Roll	6,750	diam. 16	0.94	1.29	Chill.	Hard.
	26	Chilled hollow roll	1,760	1½, 10 diam,	1.22	1.60	"	"
	27	Tumbling barrel stave	660	.8	1.82	0.84	Green.	Soft.
	28	Hollow chilled sand roll	1,320	1.2, 15 diam.	1.06	0.75	Dry.	Hard.
	29	Pulley	1,700	.6, 60 diam.	2.04	0.96	"	Soft.
G	30	Stove plate	11	1/6	1.99	0.50	Green.	Hard, too little si.
	31	Cast T rail	132	.8	2.05	0.70	"	Soft, normal si.
	32	Furnace plate	275	1.2—1½	2.15	0.75	"	" "
	33	Gas retort	1,320	1.2	2.02	0.84	Skin dry.	Hard, "
	34	Grate Bar	11	.....	0.98	1.31	Green.	Too hard.
H	35	Ingot mold	3,740	3.2—4	2.06	0.93	Dry.	Hard.
	36	Dyes for hydraulic press	2,200	6	2.05	1.12	"	"
	37	Refinery kettle	4,400	.6	1.96	1.23	"	" too much mn., too little si.
	38	Brake shoes	374	3.2	1.68	1.14	Green.	" normal si.
	39	Mandrel for pipe	2	.8	2.03	1.01	"	" too little si.
	40	Novelty castings	33	¼—⅓	2.01	0.97	"	Soft.
I	41	Drain pipe	.....	1/6—1-5	2.05	0.93	Dry.	Hard, too little si.
	42	Drain pipe	.....	1/6—1-5	2.15	0.85	Green.	" "
	43	Ribbed pipe	.....	3-10—⅓	2.17	0.91	Dry.	" "
	44	Rib of above	.....	1-10—1/16	2.18	1.07	Green	" "
	45	Blind flange	440	.4	2.31	0.81	Skin dry.	Soft, good, normal si.
	46	Pipe (pattern)	200	.4	2.26	0.81	Green.	" " "
	47	Cylinder head	2,640	.8	2.42	0.67	Dry.	" " "
K	48	Angle piece	260	.8	2.33	0.95	Green.	" " "
	49	Piston rings	660—880	1.6—2	2.15	0.57	Dry.	" " too much si.
	50	Plate	110	1.6—2	1.98	0.67	Green.	" " "
	51	Counter weight	2,640	4	2.11	0.71	Dry.	" " "
L	52	Stove plates	4½	1-12	2.30	1.06	Green.	Grey, a trifle hard.
	53	"	4½	1-10	2.18	0.94	"	" " too little si.
	54	"	3	1-10	1.85	0.87	"	" soft, silicon?
	55	"	6½	1/5	2.26	0.82	"	" " normal si.
	56	"	6½	1/6	2.05	0.57	"	" " silicon?
	57	"	7¾	1-5	2.10	0.81	"	" " "
	58	"	8.8	¼	2.37	0.86	"	" " silicon normal.
	59	"	6½	2-5	2.58	0.90	"	" " too much si.
	60	"	4½	½	2.56	0.87	"	" " "
	61	Part of Machine	8.8	⅜	2.40	0.87	"	" " "
	62	" "	6¼	1	1.86	1.08	"	" " normal si.
	63	" "	13	2	1.90	1.00	"	" " "
M	64	Plunger	7,040	2	1.01	0.50	Dry.	Fine grained, hard, too little si.
	65	Roller	330	.8—1.2	1.63	0.82	Green.	" soft, silicon?
	66	Melting kettle	15,400	2—4	1.42	0.70	Dry.	Medium grained, soft to hard, normal si.
	67	Pipe	1,300	½	2.14	0.81	"	Fine grained, soft, normal si.
	68	Stand	20,900	4.8—7.2	1.52	0.69	"	Coarse grained, tough, normal si.
	69	Casing	19,800	1⅝—2.6	1.71	0.78	"	" " " "
	70	Pressure cylinder	6,600	1.8—3	1.91	0.72	"	Fine grained, a little hard, silicon?
	71	Pipe	8,580	1.2—2.8	1.71	0.77	"	" " " normal si.
N	72	Hoisting cylinder	6,160	1¾—1.8	1.91	0.52	"	Grey, soft, normal si.
	73	Pump casting	5,280	1.8, 2, 4	2.23	0.76	"	" " too much si.
	74	Steam cylinder	25,960	1⅝, 2.6, 3.8	2.07	0.55	"	" " "
	75	Casing for foundation	1,940	.8, 1, 1.4	2.04	0.49	"	" " normal si.
	76	Fly wheel	30,800	1.6, 1.8, 5.8	1.97	0.52	"	" " too much si.
	77	Valve case	14½	.4, 1	2.06	0.49	"	" " normal si.
	78	Hand wheel	26½	⅓, .8, 1	1.88	0.51	"	" " "
O	79	Gate valve	176	.6—.8	2.08	0.69	Green.	" " "
	80	Steam valve	500	.8—1.	2.05	0.89	Dry.	" " "
	81	Press cylinder	935	1.4—1.8	1.89	1.04	"	" " "
P	82	Chilled sand roll	13,200	diam. 26, 17	0.86	0.75	"	Light grey, hard,
	83	Roll	26,400	diam. 28, 18	0.50	0.67	"	" "
Q	84	Chilled roll	39,600	diam. 32	0.47	0.64	"	White, very hard.
	85	Finishing roll	8,800	diam. 18	0.47	0.71	"	Mottled, hard.
	86	Water main	7,480	1½	1.40	0.46	"	Grey to white, too little si.
R	87	O. H. finishing roll	5,500	diam. 18	0.51	0.93	Loam.	" hard.
	88	Chilled universal roll	5,500	diam. 20	0.72	0.59	"	White, hard.
	89	Chilled universal roll (from neck	5,500	diam. 20	0.73	0.56	"	Grey, soft.
	90	Steam cylinder	7,920	average 1.6	1.33	1.13	"	" " normal si.
	91	Steam cylinder (open hearth)	12,100	average 1.8	1.42	0.96	"	" " "
	92	Locomotive cylinder	1,980	average 1	1.84	0.83	Dry	" " "
	93	Pulley	264	⅛, 16	1.68	0.98	Green.	" "
	94	Kettle for chemical works	13,200	2.1-5	1.97	1.30	Loam.	" " too much si and mn.
S	95	Annealing pot	660	1.4	1.22	1.03	Green.	Hard, too much mn., too little si.
	96	Stuffing box	22	½	2.35	0.67	Dry.	Fine grained, sof. to hard, normal si.
	97	Bearings	13	2	1.75	0.87	Green.	" " "
	98	Cross head	55	.6	1.37	0.71	Dry.	" soft, silicon?
	99	Roll	1,100	2, 2.8	4.73	0.71	"	" " too much si.
	100	Floor stand	33	1—1.2	1.72	0.67	Green.	" too little si.
	101	Steam cylinder	5,500	1.8	1.90	1.24	Dry.	Coarse grained, soft, too much si and mn
	102	Bearing frame	3,850	1.8, 4.4	1.84	0.89	"	" " " "
	103	Stuffing box	88	.8	2.45	0.67	"	Fine grained, soft, normal si.
	104	Steel casting	385	2	0.73	0.57	"	" "
	105	Housen	26,400	16x16	2.04	0.53	"	" " too much si.
T	106	Casting	4½	1.2	2.19	0.89	Green.	" " normal si.
	107	Roller strap	440	.4	2.31	0.96	"	" hard, "
	108	Lantern drip pan	9	1.0	2.37	0.96	"	Coarse grained, soft, too much si.
	109	Filter press plate	330	1.2	2.10	1.19	"	" " "
	110	Accumulator cylinder	2,200	2.8	2.21	0.89	"	" " "
U	111	Steam cylinder	13,200	1.8	1.70	0.74	Dry.	Fine grained, close, normal si.
	112	Hoisting drum	6,600	4	2.60	1.38	"	" " too much si and mn
	113	Floor stand	44	.....	2.55	1.13	Green	" hard, normal si.
	114	Steam chest cover	11	1.	1.99	0.97	"	" " too little si.
	115	Piston ring	66	.8	2.63	0.94	"	" soft, too much si.
V	116	Eccentric		3	2.03	0.69	Dry.	Grey, soft, too much si.
	117	Stuffing box		1	2.29	0.70	Green.	" " normal si.
	118	Gear wheel	11—44	1.2	2.17	0.59	"	" " "
	119	Eccentric strap		2.4	1.96	0.76	"	" " too much si.
	120	Guides		1.4	2.03	0.66	"	" " normal si.

THE REPORT ON ARMOR PLATE PLANT.

Fresh evidence that a Government armor plate works is impracticable, and would likly result in higher rather than lower cost for armor, is furnished in the exhaustive report of the Naval Board which was presented to the Secretary of the Navy on Dec. 1. The board, which included leading nava experts, consisted of Commodore John A. Howell, president; Capt. Alexander H. McCormick, Civil Engineer Mordecai T. Endicott, Chief Engineer James A. Perry and Lieut. Frank F. Fletcher as members, and Lieut. Washington I. Chambers as recorder. For four months every detail of the project has been carefully studied, leading specialists have been freely consulted, resulting in the completion of working plans with full specifications for the essential features of a plant capable of making armor for two battle-ships annually. The board foresaw that the United States might want to build five battle-ships in some years, and that in the near future extremely large armor plates might be required, but the necessity for the most rigid economy was impressed upon its members, who with the greatest reluctance suppressed many desirable but costly features. In spite of all their efforts, however, the total cost could not be brought below $3,747,912.11, of which a little less than $1,000,000 is for buildings and foundations, and a little less than $3,000,000 is necessary for the machinery, furnaces and similar essentials. An effort is to be promptly made to have these closely shaven estimates verified by actual competitive bids, for which advertisements will be issued in a few days. The improbability of success is indicated by the efforts of the board to secure estimates "from one of the largest firms in England" for some of the heaviest tools, which could not be obtained in this country. This firm replied "that it preferred to defer quoting prices until Congress should decide to establish the armor factory." The most significant feature of the board's report is embraced in three statements, devised to inform Congress of the board's opinion as to the feasibility of erecting an armor plant, as follows.

"First.—An armor factory comprises a collection of special furnaces, heavy machine tools and appliances that are not needed in any other class of work, and a class of labor specially skilled in the business.

"Second.—A Government armor factory not connected with an establishment engaged in other branches of the steel industry would depend for its success and economic administration upon a constant demand for an output nearly approaching the full capacity.

"Third.—If the Government should establish an armor factory, the efficient and economic maintenance of the working of that factory would necessarily depend upon a constant yearly appropriation for ships to be provided with armor, because the armor produced at any time must be specially designed for and fitted to these ships. Any failure to appropriate for such ships in any one year would require the cessation of work and the laying off indefinitely of the skilled experts and laborers that had been trained to this industry. A resumption of work at a later period would require the training at considerable expense of a new set of men. In the meantime the progress of the art would perhaps have been such that difficult and radical changes would be required, which under continuous working might have been gradually and easily made."

The board further says in its report: "The following estimates are for the cost, exclusive of the land, of a plant capable of making and furnishing ready for the installment on board ship of 6,000 tons per year of nickel steel, face-hardened, reforged armor. As the size of the largest single armor plate to be produced fixes the size and number of melting furnaces required and the size of the forging and bending presses, which are about the most expensive part of the plant, and as the melting furnaces and presses thus determined are capable of producing a much greater quantity of armor than herein required, it follows that the cost of a plant of increased or diminished capacity will not be in direct proportion to the greater or less output, but will be in proportion to the greater or less number of cementing furnaces and machine tools supplied.

"These estimates are made without exact knowledge of the local conditions of the site that may be selected. No freight is included, and the foundations for buildings and tools are of sufficient depth to secure stability and permanence on good hard-pan or gravel only. Nothing has been included for grading or for excavating except so far as necessary for the proper construction of the plant. Should the site selected be of such a character as to require spiling or deeper foundations than herein contemplated, the cost may be increased. Five per cent has been allowed, however, for erecting and engineering expenses, and it is thought that 5 per cent additional allowance would cover all contingencies under the worst conditions that may be encountered. The estimates are as follows:

Open-hearth department	$ 541,918
Forging and cementing shop	1,558,237
Bending and tempering shop	446,038
Machine shop	600,681
Erecting shop	91,461
Boiler shop	119,574
Power plant	134,658
Blacksmith shop	32,411
Locomotive shop	7,219
Carpenter shop	8,686
Office building	15,000
Chemical laboratory	25,000
Physical laboratory	33,000
Railroad tracks and equipment	86,642
Latrines	11,112
Water supply, sewerage, etc	33,298
Total	$3,747,912

After a careful review of the advantages and disadvantages of establishing a plant in connection with an armor factory capable of producing the steel ingots needed in making plates (the chief disadvantages being the first cost of $519,133 and the force of labor that would have to be employed), the report says:

"The board considers that the capacity to produce the steel ingots is so important to the successful and economic administration of an armor factory that it does not recommend an establishment designed to obtain the ingots by purchase. A casting department for the molds, anvils and such castings as need occasional replacement is necessary in either case, and can be profitably combined with an open-hearth steel plant, as herein outlined. In view of the advantages above mentioned, and notwithstanding the greater first cost of the establishment, the board recommends that the Government armor factory include a plant for the production of open-hearth steel ingots.

"The board has received several communications in regard to new processes for making both steel and armor. As none of these were accompanied by any tangible data by which the board could form exact estimates of their value for making armor, the writers were informed that, 'owing to the short time allowed the board to make its report, it would be impossible to consider any methods for the manufacture of steel for armor, except those in general use at this time.' The board has learned, however from the press and from reliable armor experts, that certain improvements in the methods of manufacture not fully known in this country have been introduced abroad, which greatly improve the ballistic properties of the plates. The board has also obtained some knowledge of an experimental armor plate in progress of making in this country by a method quite different from the Harvey dementation process, from which the manufacturers seem to expect good results. These facts are mentioned to show that an armor plant, equipped as provided in this report, must be capable of change or expansion, to suit the introduction of new improvements looking to increased ballistic properties or to decreased cost of production. The board cannot say that the introduction of such new improvements in the future will radically change the character of the plant here submitted. Any change in method that improves the ballistic properties of armor plate has a very serious bearing upon the science of naval architecture, but it is evident in any factory which may be established it must be held in contemplation that changes will have to be made therein from time to time to keep it up to date in its processes and products.

"Although a proving ground for testing armor plates is not essentially a part of an armor plant, we take this opportunity to recommend the establishment of a proving ground at or near the site of the proposed armor factory, of sufficient capacity to permit of the necessary tests both for final acceptance and for experimentation."

The report contains much in the way of appendices. There are thirty-eight drawings, besides the specifications, details of estimates, list of places recommended for sites, form of proposals, besides much other matter. The board says it will be impossible to furnish copies of all these matters to applicants, and intending bidders will find it imperative to come to Washington if they would make intelligent bids.

POINTS ON STEEL FORGINGS.

At a recent meeting of the Western Society of Engineers, at Chicago, following the Eastern trip of the society, in which the Bethlehem Iron Co.'s plant was visited, Mr. H. F. J. Porter, representing the latter company, was present to answer questions relative to points that had come up in connection with the inspection of the Bethlehem works. We make some extracts below from the discussion:

The first question was as to the hydraulic pressure per square inch in the large press at these works.

Mr. Porter: The hydraulic pressure per square inch is 7,000 pounds. I do not know the exact area of the two plungers of the press, but the total capacity of the press is 14 000 tons, which is developed when the 15,000 horse-power engine is running with 150 pounds of steam pressure and 80 revolutions per minute.

President Johnston: One question that I intended asking at the mill was as to the size of the armor plate that was being forged at the time that we were at the works.

Mr. Porter: This plate was for the turret of the cruiser. Kearsarge. It was 11 feet 2 inches long, 9 feet 10 inches wide and 15 inches thick and weighed about fifty tons.

Below are given the answers to a succession of questions:

We have made plates 20 inches thick, a great many 18 inches thick. The hammer is being rapidly abandoned. Krupp, I know, has put in presses, but there are one or two armor plate manufacturers in Europe who have not given up the hammer altogether. At Bethlehem it has not been used for four years. The length of time a piece of metal can be worked upon without reheating depends upon its size. We must keep it up to a certain temperature, about 1,800 degrees, at least, and below that we must reheat it. The piece of armor plate seen on the visit to the works would hold its heat over an hour. The work of forging keeps up the heat.

A Member: I would like to ask Mr. Porter, if I can do so with propriety, what is the chief item of the increased cost of the Government work that is turned out; that is, I mean to say, is it on account of the rigid inspection and throwing out of defective plates?

Mr. Porter: Well, in the first place, armor plate being made of nickel steel, the metal itself is expensive. Then, again, nickel steel in its working requires the greatest care. It requires the highest skilled labor and the largest and most powerful tools that we have in our works to handle the large masses of very tough metal. The very large press, for instance, which you saw working on a piece of armor plate costs considerable money, as you may imagine, per hour to operate, and the cost runs about the same on all the tools for that kind of work. There is a great deal of hand labor on it also, because in certain stages no tools have been invented that will do the necessary work on it. Then it takes a week, and sometimes two weeks, to heat up one of those big masses of armor plate, as the heat has to be applied gradually, and it happens occasionally that after spending months on a piece of armor plate we find, when about finished, that there is a crack in the plate and it has to be rejected. Then the harveyizing process is expensive. Every time you heat such large masses of metal it takes a vast amount of fuel; the general expense chargeable to this department is very large. If we could have a contract for armor plate that would keep our armor plate department busy the year around, just like a shoe factory, turning out our armor plate as people do shoes, we could reduce our price enormously. But if we have a plant that will get out 10,000 tons of armor plate per year, and only get an order for two thousand tons, it is like having a great big shoe factory capable of making 10,000 pairs of shoes and turning out only 2,000 pairs, and when we charge up the expense against the 2,000 pairs of shoes, each becomes expensive.

I have been asked by quite a number of members regarding the method of making hollow forgings, as to whether they were cast hollow or not, and there seems to be a good deal of uncertainty on that point. Ingots from which hollow forgings are made are cast solid. The object of doing this is to take care of two defects, viz. segregation and piping. They occur in that part of the ingot that cools last. By casting the ingot solid we make the center the part that cools last and collect the defects there. Then we bore it out. After it is bored, as you saw in a hollow forging that was being made, it is reheated and a steel mandrel put through the hole and then the press is used to forge it out on the mandrel.

Mr. Condron: I noticed outside of the works a hollow forging which I think had an internal diameter of 30 inches, as I remember it, possibly larger. Now I do not know whether it was a gun jacket or what it was; quite a large mass, like a piece of pipe. Was that made in the same way that you speak of?

Mr. Porter: That was a gun jacket, and it was made in very much the same way, except that instead of keeping the anvil block under the work it is removed and the mandrel is supported at each end on horses and thus becomes an internal anvil. The hole is thus enlarged and the metal is expanded into a ring. You probably noticed a very large ring that was on a car out in the yard, about 11 feet in diameter and 5 inches thick. That was a field ring for one of the Westinghouse generators at Niagara Falls and was made in this way.

There are one or two things that I would like to speak of. There is a very strong impression abroad that the work as turned out by the Bethlehem Iron Co. is very costly. Now, generally speaking, it is a little higher priced that similar work in the market. When purchasing agents, who are merely instructed to order forgings, ask for bids on them, we will say for a shaft or a connecting rod or piston, rod, or something of that kind, they will find that the prices quoted by the Bethlehem Iron Co. are higher, unless the specifications are so drawn that all the forges bidding on them would bid on the same basis. At our works we have a great many inspectors from large machine shops, from private consulting engineers, from the army and navy departments of the Government. We have adopted a standard of work to meet the requirements which these inspectors are there to see carried out. Certain rules demanded by best practice are followed. For instance, it is customary for us, when a forging is ordered, to make it from an ingot at least twice its diameter. I should not say "at least," because sometimes it is a little less. If you want, we will say, a 26-inch shaft, as ingots do not come exactly twice that diameter, we could not adhere exactly to our rule. They do, however, come 50 inches in diameter, and that is the size of ingot we would use. Now, unless a man who is in the market for a 26-inch shaft should specify that the ingot from which that shaft is made should be at least 50 inches in diameter, or approximately twice the diameter of the shaft, we would bid the higher price because other forges have no presses and there is not a hammer in this country could turn it out properly. Let me give you an instance. On my way West I stopped over at Pittsburg to visit a large engine works there. We had bid only a couple of months ago on eight steel shafts 26 inches in diameter for engines that they were building, and I wanted to see the shaft. I think our price on those shafts was in the neighborhood of 3½ cents per pound, possibly a little less. They were bought elsewhere for 2½ cents per pound. I subsequently stopped at the forge that turned out those shafts. I asked the foreman what his custom was in making his forgings, as to the size of the ingot that he worked them down from, and he said that "they varied," and that was all the information I could get from him on that score. His large hammer had a capacity for 10 tons; the cylinder was 18 inches in diameter and 42 inches stroke. I asked him to measure the distance from the under side of the hammer head, which was raised to its limit, and the top of the anvil block, and it was just 42 inches. They could not possibly have put a 50-inch ingot under their hammer, and yet they made those eight 26 inch shafts. They must have been made from small ingots, and if so the metal could not have been worked sufficiently to make good forgings; at all events, the hammer was entirely too light to affect the central metal of forgings of the size of these shafts.

Let me refer you to a recorded case which will show exactly what happens under conditions such as I have named. If you will refer to the government report of the tests of metals at the Watertown Arsenal for 1885, you will find on pages 944 et. seq. the records of the tests made on the broken shaft of the U. S. Cruiser Dolphin. This shaft was made of steel from a 30-inch ingot under a 10-ton hammer, the cylinder of which was 36 inches in diameter and 8 feet stroke. Four test specimens were taken out of the metal at various distances between the surface and the center.

The test piece nearest the surface showed an elongation of 21.4 per cent, and a contraction of 32.8 per cent; the next one showed an elongation of 7.2 per cent and a contraction of 5.5 per cent; the one still lower showed an elongation of 4.9 per cent, and a contraction of 5.2 per cent; and the one nearest the center showed an elongation of 2 per cent and a contraction of 1 per cent. In other words, the elongation varied between the surface and the center from 21.5 per cent to 2 per cent, and the contraction varied from 33 per cent to 1 per cent. You can see, therefore, that the center metal in this forging was practically unworked. In order to be certain that there was nothing in the metal itself that would give this difference, they cut out from the opposite side specimens of a larger size and forged them down until they were of the same size as the first. In other words, they put work into the metal that ought to have been put into it when it was first forged, and as a result an average of 25 per cent elongation and 55 per cent contraction was obtained.

Here is another instance of the same kind of work. A gentleman who belongs to your Technical Club here visited our works a short time ago. He was only recently connected with one of the largest steel plants in the country, and he told me that the Illinois Steel Co. had asked for prices on three plate bending rolls. I think they were about 18 inches in diameter. We bid on them, and the other representative forges bid on them, and one of them got the order. There are no other forges than ours that make their own steel, and the forge that secured the order ordered the ingots for these rolls from the steel mill that this man is connected with, and he told me that they returned one of the ingots, saying that it was "under-size" $\frac{3}{4}$ of an inch. He told them that it was not unusual to have ingots vary $\frac{3}{8}$ of an inch in diameter, that is, $\frac{3}{16}$ on a side; that steel could vary that much simply from shrinkage. The purchasing agent gave himself away by writing back that in this instance the ingot would not "turn up!" In other words, the ingots were simply rough-turned and sold as forgings. He found out that there was no forging done on them except at the necks or the bearings at each end, which were quite small.

There is another point that I would like to speak of. Yesterday I was at some of the large engine works at Milwaukee. They told me that the shafts which they generally bought in the market were not annealed—that they did not require them to be annealed. Now you know that if a shaft is not annealed, it has forging strains and strains due to irregular cooling and uneven heating remaining in it. They told me that it was customary for them, on account of these residual strains in their shafts, to rough turn them, then to cut the key-ways, and finally finish them. The reason they cannot cut the key-ways after the shafts are finished turned is that when a key-way is cut, the fiber strains at that point are released, which allows the shaft to spring to such an extent as to be too crooked for use. Every shaft that we forge is carefully annealed and will not spring. The molecules of the metal then adjust themselves to a condition of rest and they are true from the time they leave our works until they have had some great stress put on them from outside sufficient to bend them. Now shafts that have been submitted to this extra work, and which are absolutely perfect, as near as human ingenuity can make them, will cost a little more than those which are made as I tell you some people make them.

There is one other thing that I would like to speak of. We not long ago sent to Watertown Arsenal a series of bars of steel, to be tested for fatigue of metal. The records of these tests are in the last issue of the Government reports of the Watertown Arsenal. We have recommended that for shafts and moving parts of machinery that are apt to be affected by stresses alternating from compression to tension, or from either stress, to its absolute release, where fatigue of metal so-called, is what acts to destroy the piece eventually, that a high carbon steel should be used, and our recommendations are based on the result of experience, and these tests at Watertown confirm it. Forgings will fail, either from some defect due to manufacture or from fatigue of metal. These "fatigue tests" were made in this way. The bars, 36 inches long, one inch in diameter, are clamped at one end in a chuck, in a lathe, with the other end resting on a bearing. In the center, a lever runs across the bar, and a weight at the outer end of the lever presses it down so that the bar is slightly bent. Then the bar is revolved at a speed of 1,500 turns a minute until it breaks. Thus we have an actual case of rupture from fatigue. The bars that had .24 carbon, when simply annealed, broke at 230,000 revolutions; when oil-tempered, at 350,000 revolutions; the .46 carbon broke, when annealed, at 975,000; when oil-tempered, 1,700,000. The .66 carbon broke at 3,700,000, and when oil-tempered at 4,225,000; so that by a little more than doubling the carbon in the steel you more than 20 times increased its capacity to resist fatigue. The conditions under which these tests are made are similar to those affecting engine shafts, and to a certain extent they are the same in connecting rods and piston rods that are subjected to alternating compression and tension.

The general custom in machine shops is to use a low carbon steel (of about .10 to .25 per cent carbon), for the reason that machine tools are not many of them calculated to work the higher carbon steel. This latter metal is very tough, and if it is worked like soft steel the tools break or the metal is torn all to pieces. If it is properly worked with a very fine cut and a high speed, the headway is comparatively slow. Under either condition, therefore, the cost of using high carbon steel is more expensive. But if the engineer wants to get the best, he ought to specify that sort of material, and not get what it is to the interest of the machine shop to give him.

* * * Nickel increases very perceptibly the elastic limit, just as carbon does, and if there were no other circumstances affecting the stress on the piece, I think that nickel steel would be very good for the purpose, but it is found that heat has a very disappointing effect, you may call it, on nickel steel. Oil-tempered nickel steel does not give as good results as simply annealed nickel steel, and in cases where stay-bolts would be used it is just possible that this effect of heating and cooling the stay-bolts alternately might very seriously affect nickel steel. They are only beginning to use nickel steel for boiler plates, and it has not been used long enough to satisfactorily recommend it. It has been used in a few boilers, but I have not heard of its getting into general use. I think it is only being experimented with.

THE Australia, the biggest carrier on the lakes, was launched from the yards of the Chicago Shipbuilding Co. on the Calumet River, Nov. 27. It is almost a duplicate of the Amazon, recently launched from the same yards. The Australia is a towing schooner and will carry no sails. It is fitted with an electric light plant, steam pump, steam winches, steerer, and heat. Length over all, 388 feet; keel, 376 feet; beam, 48 feet; depth, 26 feet. Carrying capacity, 6,500 tons. The Australia will be added to the Corrigan fleet.

A ST. LOUIS dispatch says that the Madison Car Co., at Madison, Ill., has been absorbed by the Missouri Car & Foundry Co. The East Side car works, which have been idle a year, will be reopened as soon as possible. The works will be operated as part of the Missouri Car & Foundry Co.

IN *Lippincott's Magazine* for December, the complete novel is by Julia P. Dabney, under the title "Poor Chola." The scene is Teneriffe in the Canary Islands, and the plot is quite out of the ordinary. In "Who Are the Greeks?" W. A. Curtis shows that they are really descended from the Greeks of old. "The Red Light" deals with a supposed episode of the war of 1812. "Gold-Mining in North America," by Geo. Ethelbert Walsh; "Uncle Sam's Four-Footed Friends," by Charles Dudley Rhodes, U. S. A., and "The Club Movement Among Women," by Emily Tolman, are other articles worthy of attention.

CHAS. LOWTHIAN BELL, who recently returned to England after a tour of the United States, investigated the Uehling casting and conveying apparatus, and it is the expectation that it will be adopted for the blast furnace plant in Barrow, with which his father, Sir Lowthian Bell, has been so long connected.

A. F. YARROW, of Yarrow & Co., of Poplar, London, now traveling through the United States, while at Cincinnati placed an order with the Davis & Egan Machine Tool Co. for several machine tools. Through its Amsterdam office the company has an order for a special combination turret lathe, for the Netherlands government.

ELECTRIC MOTORS FOR ROLLING MILLS.

Ernest K. Scott, in a recent contribution to the *Iron and Coal Trades Review*, says that owing to the extreme variations of load it has generally been considered to be extremely difficult to drive rolling mills by means of electric motors, and this idea has probably been helped because up to the present a ponderous slow-running engine (in some cases the ancient beam engine) has generally been employed for the work. While it is true, however, that the electric motor is essentially a high-speed machine, the experience which has been gained with large multipolar direct-driven dynamos for traction and power work shows that dynamo-electric machinery may be economically built for any speed, even so low as 60 revolutions, and at the same time give ample fly-wheel effort.

There is no doubt that the motor would have its work cut out if applied to some of the older and heavier rolling mills, on account of the jar and vibration due to the gearing; but with the armature coils sunk into the armature core and thoroughly insulated the difficulty could be satisfactorily met. As a matter of fact, it is not at all clear that the users of rolling mills believe in toothed wheels to the extent they did; for at the Bromford Iron Works, West Bromwich, three sets of double leather belts (the largest a 20-inch on a 22-inch) have been successfully driving heavy pairs of rolls for some considerable time. Of course, with such belt drives the matter, so far as the electric motor is concerned, is quite simple, and the ordinary two-pole type with smooth-cored armature will do very well.

Motors have for some time been successfully used on bending rolls for boiler plates, and the conditions of service in this instance and in rolling mills are very similar. In the case of machiness built by the Niles Tool Works the motors are given a speed of 300 revolutions a minute, but this can be varied within wide limits by controllers. The motors are made by the Card Mfg. Co., and are of the steel-clad type with a spring suspension, in exactly the same way as a tramcar motor, which is found to be an advantage, because of its enabling the motor to give slightly in starting against a load. Controllers for this kind of service are frequently made almost as large as the motor; and this is a good point, because being the part which is directly handled by the workmen, it is very liable to be damaged. Not a few of the mishaps which have attended the application of motors, especially reversible motors, to machine tools, winding engines, etc., have been due to the skimping of this detail, for experience has shown that handles and gear which will work very well in a test room, or even in an electric engineering workshop, are apt to have a very short life when in the hands of the ordinary workman, who will break them if he can. Seeing that the breakdown, if it does occur, is blamed onto electrical work generally, it therefore behooves manufacturers to put plenty of metal into those mechanical details which must of necessity be handled by strangers.

In driving the lighter class of rolling plant there is undoubtedly a good opening for electric motors; and when a little experience has been gained in the work, no doubt some of the very heaviest class of rolling mills will also be actuated electrically. That there is room for improvement on present practice is shown by the fact that the large direct-coupled rolling mill engine is very liable to stop on or near the dead centers, or at any rate in such a position that when starting again it cannot exert its full torque. A very much larger engine than is really required has therefore to be laid down; and as it works at low efficiency, its steam consumption cannot be less than six or seven pounds per indicated horse power. With an electric motor there is no dead center, and the engine employed in generating the electric energy may be of the most efficient triple-expansion high-speed type, taking only about 1¼ pounds per indicated horse power.

Another advantage of employing electric power is that the whole of the auxiliary work of moving the live rollers, the elevating and traverse gear and the overhead cranes can be effected by separate motors, all receiving energy from some central point under the most efficient conditions and at a great saving in labor.

TEN new 80-ton engines have been ordered for the "Bessemer" road from the Pittsburg Locomotive Works.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our davertisers at once.]

The Champaign Machine & Supply Co. has been incorporated at Champaign, Ill., with a capital stock of $10,000, by F. A. Sager, A. L. Beardsley and S. K. Hughes.

Joseph W. Comley, Braddock; James S. Bedell, William S. Frye, James P. Beam, and William W. Payne, of Jefferson Co., Pa.; Leon J. Long and John C. Werner, of Pittsburg, and Arch H. Rowand, Jr., of Verona, have organized the Joseph Comley Copper & Steel Co., of Cove Valley, Pa., which will weld iron or steel and copper by a new process.

J. H. Day & Co., Cincinnati, are in the market for second-hand slitting and cross-cutting power shears for three-eighth-inch iron or less.

Allan D. Arthur, Geneseo, N. Y., asks estimates on iron-working machinery.

David F. Armstrong, Creswell, N. C., asks figures on 30-horse-power boiler and hoisting engine, wire rope, iron and wood blocks, shafting, pulleys, belting, etc.

New Construction:—

A tract of 60 acres of land at the junction of the Grand Trunk Railroad and 139th st., Chicago, has been bought by the Euclid Mfg. Co., of Cincinnati, O., for $125,000. The Euclid company has a large capitalization, being backed by a number of iron men of Cincinnati. It has already commenced laying stone for the foundation of a large one and two story iron building, 70 x 300 feet, which will employ from 200 to 300 men within the next 60 days. The company will manufacture steel wheels for cars, wagons, road graders, separators and agricultural wheels, also tubular steel wheelbarrows, steel rubber tire buggies, etc. It will consume from 30,000 to 50,000 tons of steel a year, with an annual capacity of 1,500,000 wheels. Frank L. Bronson, as general manager, will have charge of the Chicago office. It is also the company's intention to locate several other industries on this site, which will necessitate the building of other factories by spring.

The Foxboro Foundry & Machine Co., of Foxboro, Mass., whose building was recently destroyed by fire, will rebuild the plant in a substantial and fireproof manner. The main foundry building, which is about 80 feet wide and 140 feet long, is being replaced by a steel frame structure. A traveling crane runway, for handling materials in the building is being arranged for, and provisions are also being made for suitable jib cranes. The steel framework is being furnished and erected by the Berlin Iron Bridge Co., of East Berlin, Conn.

The American Tin Plate Co., Elwood, Ind., has begun the erection of a two-story assorting building, 100 x 200 feet, which was made necessary by the increased output. The company has started up the new bar mill.

The contract for the new foundry building of Lockhart & Anthony, at Bellefontaine, O., has been let.

The Clark farm, near Monongahela City, Pa., has been purchased from the Romena Land Co., in the interest of Senators Quay and Penrose and Pittsburg capitalists, it is said. Extensive mills are to be erected, it is said. C. G. McIlvain, of Monongahela City, conducted the negotiations.

The Donaldson Iron Co., at Emaus, Pa., will build a new pipe foundry with three pits. The building will be 50 x 86 feet.

The Standard Steel Works, at Burnham, Mifflin County, Pa., are to build a new machine shop, 100 x 70 feet.

Several tin mill projects are under consideration in Western Pennsylvania. Robert J. Scott and other capitalists at Pittsburg have in contemplation the erection of a six-mill plant on a piece of land between New Castle and Mahoningtown. They have an option upon the property, and also on some land up the Monongahela River. A decision will be arrived at before the end of the year.

W. DeLancey, of Minneapolis, has the contract for building the machine and car shops and the boiler house for the Great Northern Railway at Superior, Wis. The dimensions of the car shops will be 360 x 90 and the boiler house 50 x 75

COCHRANE HEATERS
FOR HEATING FEED WATER
FOR PURIFYING FEED WATER
USED BY MANY OF THE LARGEST AND BEST PLANTS IN THE U.S.
HARRISON SAFETY BOILER WORKS PHILADA. PA.
MANUFACTURERS.
FOR PURIFYING EXHAUST STEAM
FOR TAKING WATER OUT OF STEAM.
COCHRANE SEPARATORS

feet. By the terms of the contract the buildings are to be completed by Jan. 1. Schmidt Bros., of Superior, have the contract for building the roundhouse and laying the foundation for the shops and boiler room. The building proper when completed will cost in the neighborhood of $55,000.

The Pennsylvania company has announced its intention to construct a third track from Altoona, Pa., to Gallitzin. This will give employment to about 2,000 men and will involve an outlay of nearly $500,000.

It is reported from East Liverpool that W. H. Banfield, of the Irondale, O., tin plate plant, has purchased 20 acres of land at East Liverpool, as a site for a sheet mill plant.

The plans which have just been adopted for the erection of the new sheet mill on the Kiester farm at Scottdale, Pa., provided for six sheet mills. The main building will be 60 feet wide and 300 feet long.

The Mechanics' Foundry Co., Rockford, Ill., will erect a foundry.

The Cambria Iron Co., whose Otto Hoffman by-product coke ovens have been quite successful, will add 100 ovens to the Johnstown plant in the spring.

Additions, Enlargements, Removals, Etc.:—

The High Point (N. C.) Machine Works are figuring on enlarging their plant to increase its engine-producing capacity.

The Dora Foundry & Machine Co., Pulaski, Va., is making improvements to its plant, putting in additional machinery, electrical plant for lighting, etc.

It is stated that the Gadsden Pipe Works, Gadsden, Ala., will increase the capacity of their plant 33 per cent.

The Griffin Wheel Works, located at South Tacoma, Wash., have begun the work of trebling the capacity of the plant, making it the largest on the coast.

A one-story addition, 95 x 67 feet, will be built at the machine shop of the Standard Steel Works, at Burnham, near Lewiston, Pa.

The Ft. Pitt Bridge Works, at Canonsburg, Pa., are to be enlarged by an addition 80 x 150 feet. The firm has been kept very busy of late and the additional building is needed to meet the demand.

Arrangements have been completed between the McCool Tube Co., of Beaver Falls, Pa., and the Boston Electric Conduit Co., now operating a new and extensive plant in Versailles, Pa., whereby the latter company will remove its plant to Beaver Falls and occupy part of the space in the buildings of the McCool Co., and at the same time erect additional buildings. The conduit company manufactures conduits for conveying electric wires in buildings and underground. It uses tubing which is coated inside and outside with rubber, and the tubing made by the McCool Tube Co. is used to the extent of over 1,000,000 feet per month. Moving the plant to Beaver Falls will save the freight, handling, etc., on the tubing. The company has let the contract for one additional building, 40 x 70 feet, in which to place furnaces.

Simonds Rolling Machine Co. Fitchburg, Mass., has recently enlarged and improved its plant. This concern makes antifriction steel balls for all purposes, also round forgings of all kinds.

Fires and Accidents:—

The blowing out of the cylinder head of the old sheet mill engine three weeks ago, and last week a similar accident to the new sheet mill engine of the Reeves Iron Co., Canal Dover, O., caused a shut-down, with little prospect of resuming until the end of the year. The mills are quite full of orders.

The Central Iron Works, Quincy, Ill., has sustained a $2,000 fire loss, covered by insurance.

General Industrial Notes:—

The Rockford Bolt Works, Rockford, Ill., have been for some time past running full time, and report excellent prospects for the future. The only thing necessary for a complete return to prosperity, according to Mr. C. R. Wise, secretary of the company, is to have prices raised from their present low level to what will give them a fair profit.

The Reading Car Wheel Co., Reading, Pa., has just completed a large foundry, the electrical equipment for which was designed and built by the Northern Electrical Mfg. Co., of Madison, Wis. All molten metal in the foundry is handled by motors, and the blowers, elevators, rocking cranes, hoisting cranes, drop hoists and all the other machinery is operated by electricity. This is one of the most complete installations of electric power yet made in a foundry.

At Racine, Wis., the J. I. Case Threshing Machinery Co.'s plant, idle for three months, resumed this week and it is expected 600 hands will be at work within a month. The J. I. Case Plow Co., idle for several weeks, has resumed.

The Alleghany Iron Co., of Iron Gate, Va., has leased the furnace of the Virginia Development Co., at Buena Vista, and after repairs will put it in blast in the near future.

The No. 2 furnace of the Andrews & Hitchcock Iron Co., at Hubbard, O., started last week. All Mahoning Valley furnaces are now in blast.

Workmen are repairing the Corning steel plant at Hammond, Ind., which has been idle since October, 1896, and preparations are under way to open the plant by Jan. 1. It was last operated by the Illinois Steel Co.

The Otis Steel Co., Cleveland, filed two mortgages, Nov. 20, to Edwin Waterhouse, of 44 Gresham st., London, Eng. One is dated Aug. 5, 1896, and the other Sept. 23, 1896. One is for £50,000, the other for £150,000.

The Bickford Drill Tool Co., Cincinnati, O., has an order for a large No. 3 radial drill from Yokohama, Japan. This is said to be the first American radial drill ever placed in Japan. Orders from France, Russia, South Africa and Germany have also been received in the past few weeks, and the domestic demand has improved.

The Central Iron & Steel Co., Brazil, Ind., has gone on double turn in nearly all departments. This is said to be the first time for three years that a double turn has been worked.

The National Tube Works Co., of McKeesport, has secured a California contract for 30-inch lap welded pipe, to be fitted with its patent flange coupling. It is for irrigation purposes.

The Cambria Iron Co. will use compressed air engines in its coal mines near Johnstown, Pa., and an order has been placed with the Baldwin Locomotive Works.

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick

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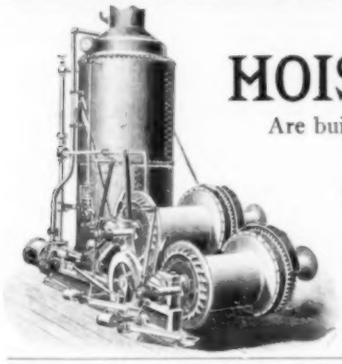
ST. LOUIS, 516 N. Third St. WASHINGTON, Kellogg Bldg.
MONTREAL, J. G. Sibbald, 3 Windsor Hotel.
SAN FRANCISCO, John Woodlock, 26 Beale St.



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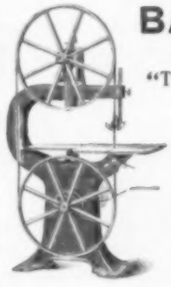

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Belt Power and Foot Power.

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LEETONIA, O.

No. 4 Front Street.

The National Tube Works Co. and the Pennsylvania Tube Works Co., of Pittsburg, have received inquiry from London lately for bids on a large quantity of 30-inch, 24-inch and 19-inch pipe.

The E. W. Bliss Co., of Brooklyn, has just received a contract from the Government for torpedoes and launching apparatus involving an expenditure of $160,000. Twenty-five torpedoes are included in the award.

The Haskell & Barker Car Works are building 1,500 box cars for the Illinois Central. These works are now employing the largest number of men ever at work there. The Michigan Central has contracted with the Michigan Peninsular Car Co. for 750 more box cars of the same pattern as the 250 recently delivered to that road. The Barney Smith Co. is building 100 box cars of 60,000 lbs. capacity for the C. H. & D.

The furnace of the Sharon Valley Iron Co., at Sharon Valley, Conn., has gone into blast.

The Brightman Mfg. Co., Millersburg, O., have just closed a contract with the Kirkstall Forge Co., of Leeds, Eng., for an entire outfit to finish shafting from ¼ to 6 inches inclusive.

The Pennsylvania Steel Co. is improving its old No. 1 open-hearth plant, which contains two furnaces, the first built at the Steelton works.

The earnings of the Consolidated Steel & Wire Co. for the half year ending July 21, 1897, were $540,000. If the second half of 1897 should be as good as the first, earning on the $4,000,000 stock will be 27 per cent.

The furnace of the Temple Iron Co., Temple, Pa., is being prepared for blast.

The St. Louis Stamping Co. and the Granite City Steel Co. are reported to have merged. F. G. Niedringhaus will be manager, with headquarters in New York and W. F. Niedringhaus will be in St. Louis. Other plants, it is reported, are to be taken in.

A suit was begun against the K. D. Steel Range Co., in Cleveland, Dec. 3, by Walworth Run Foundry Co. It alleges that the concern is insolvent. The court is asked to declare void the transfer of bills and accounts to the Euclid Avenue Savings & Banking Co.

It is reported that Robert B. Byars & Co., of Swansea, Wales, have purchased a considerable interest in the Ellwood Tin Plate Co., of Ellwood City, Pa. Sydney Byars, it is stated, will be on the board of directors, and the general agent at New York of Byars & Co. will be general agent of the Ellwood company.

F. Pickering, of Sandusky, O., well known in the stove trade, having traveled for many of the leading foundries of the country in the past 25 years, will represent the Bellaire

Do you want to BUY or SELL any

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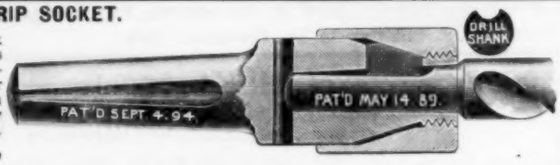

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SPECIAL SHAPES MADE TO ORDER.
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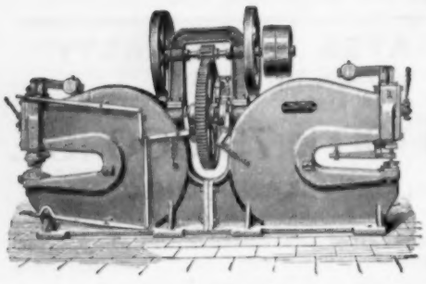

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POWER PUNCHING AND SHEARING MACHINERY.
Belt, Steam or Electrically Driven.
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Stove Co., Bellaire, O., in Western and Northern Ohio and Indiana during 1898. E. R. Reed will continue to call upon the trade in his usual territory, and R. C. Montgomery will look after the company's interests in Eastern Ohio and Western Pennsylvania.

The Sharon Fire Brick works of J. V. Rose at Sharon, Pa., furnished the brick for the repairs to the Salem Iron Co.'s furnace at Leetonia, O.; also the brick for relining Mabel Furnace at Sharpsville, Pa.

The Monongahela Tinplate Co. proposes to increase the capacity of its plant from five to nine mills. The entire hot-mill department is to be remodeled, while the cold rolling department will also be changed and the stands arranged tandem style. All of the tin mills in the Pittsburg district report large orders and it is likely that they will all be in active operation throughout the winter.

Advances in wages of blast furnace employes in the Shenango Valley were made Dec. 1, ranging from 10 to 20 per cent.

The works of the Laconia Car Co. at Laconia, N. H., after a two years' shut-down owing to financial troubles, will resume operations at once, employing 600 men.

In the patent suit of Frank H. Buhl, of Sharon, Pa., against John Stephens, manager of the Midland Steel Co., of Muncie, Ind., the U. S. District Court decided in favor of the latter. Stephens, while manager of the Sharon Iron Co., Ltd., patented a polished iron and Buhl claimed the rights.

The Morgan Construction Co., of Worcester, Mass., has recently closed a contract for the construction of a continuous mill plant for the production of rods, barrel hoops or cotton ties. The new plant will be located at the Joliet Works of the Illinois Steel Co.

Robert K. Cochrane & Co., of Pittsburg, have taken the agency for the sale of the Wood safety water tube boiler made by the Schuylkill Foundry & Machine Co., Conshohocken, Pa.

Furnace "B" of the Carnegie Steel Co.'s plant at Braddock will be taken out of blast this week, in order that repairs may be made.

Sheet workers at the United States Iron & Tin Plate Mfg. Co.'s plant at Denmmler, Pa., are striking for the Amalgamated scale.

H. W. Lash, T. A. Gillespie and others, of Pittsburg, are connected with the reorganized company which will operate the Minneapolis Rolling Mills at Columbia Heights, Minneapolis. Mr. Lash is to be president. An open-hearth department is to be added to the plant.

To Vote on Selling to the Wire Rod Combine.

Action that will probably be taken by several other concerns in the next few weeks is announced thus by the Oliver Wire Co., of Pittsburg:

"Notice is hereby given that a meeting of the stockholders of the Oliver Wire Co. will be held at the general office of the said company, corner South Tenth and Muriel streets, Pittsburg, Pa., on Tuesday, Jan. 4, 1898, at 2 o'clock P. M., for the purpose of considering a proposition for the sale of the real estate and other property of the said company. Henry B. Lupton, Secretary."

The Oliver Wire Co., through its connection with the Oliver Mining Co., the Oliver & Snyder Steel Co., and the Oliver Coke & Furnace Co., has control of all materials from ore up. These related interests are embraced, also, in the plans now being discussed for the proposed wire rod consolidation.

DURING November, Jones & Laughlins, Ltd., of Pittsburg, made and sold more cold-rolled shafting than in any preceding month in their history.

Steam Yachts and Marine Machinery.

Also Towing Launches built by Marine Iron Works, Clybourn and Southport avenues, Chicago. Free illustrated catalogue. Write them for it.—*Adv.*

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Runs as freely as an ordinary rope tackle block. Holds more securely than a chain block. Locks instantly and does not cut the rope. Allows the load to be lowered safely and slowly, the operator using only one hand. Can not stick nor jam when the load is to be lowered.

"I have tested the Burr Self-locking Steel Tackle Block and find it the most practical, quick and reliable safety-lift I know of."
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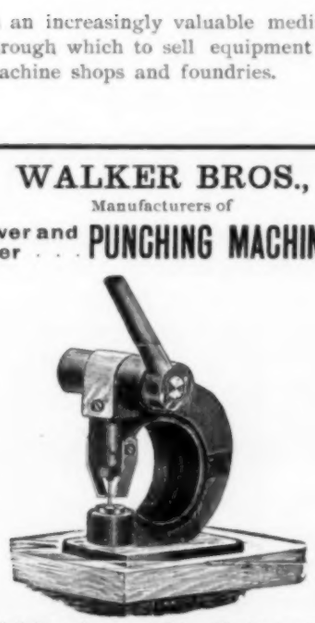

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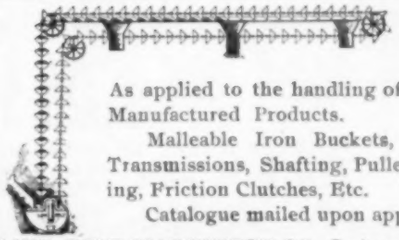

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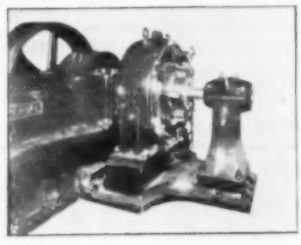

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James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge, been issued in this or any other country."

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OF THE
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Will be sent postpaid by *The Iron Trade Review* at **$6.**

Is a thorough revision of the list of blast furnaces, rolling mills, Bessemer and Open-Hearth steel works, plate and sheet mills, nail mills, tin plate mills, malleable, cast iron pipe and wrought pipe works, car wheel and locomotive works.

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Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	† 3:15 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:40 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:50 am	* 5:30 pm
Akron and Columbus	* 8:50 am	* 5:30 pm
Akron and Columbus	† 1:40 pm	†12:10 pm
Col. Cin. Ind. & St. L.	‖ 8:00 pm	* 7:30 am
Col. Cin. Ind. & St. L.	‡ 11:20 pm	.....

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Valley Jctn. & Way Stations	*6:20 P M	*7:10 A M
Akron, Canton & Valley Jct	*10:05 A M	*3:30 P M
Akron, Canton & Chicago	*8:10 A M	*6:45 P M
Akron, Canton & Wooster, Defiance, Garrett, Marietta, Wheeling, Washington, D. C., and Baltimore	†2:25 P M	†11:00 A

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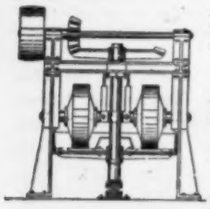
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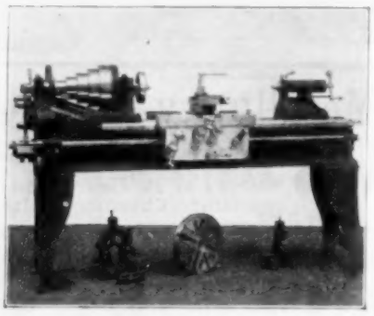
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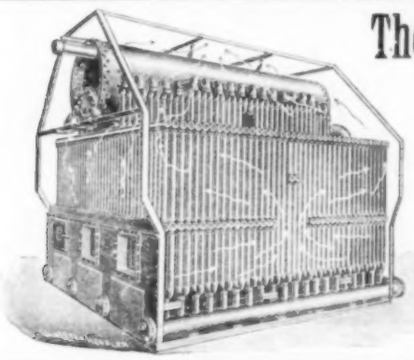

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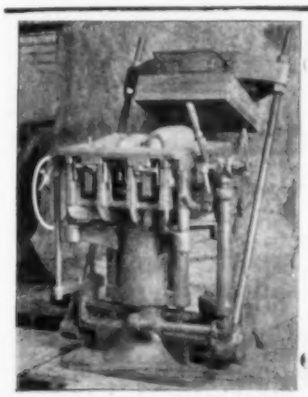

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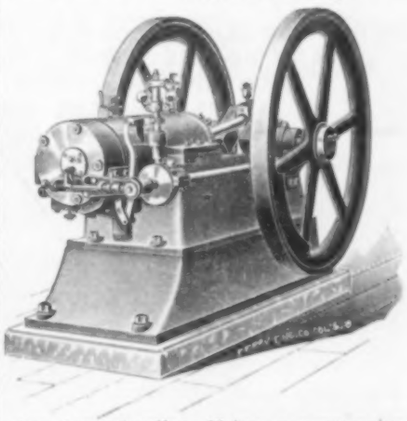

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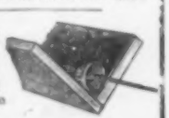

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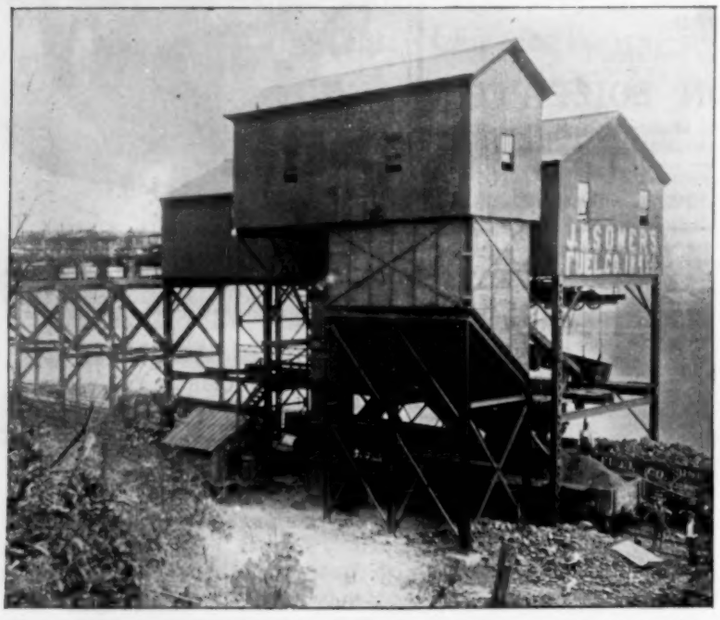

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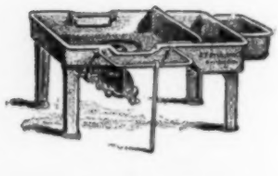

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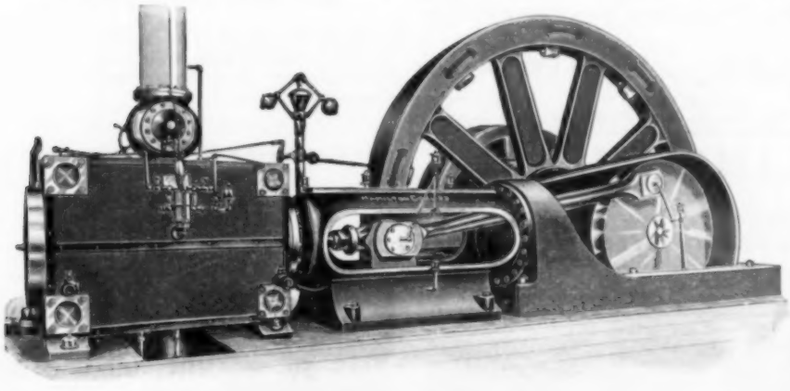

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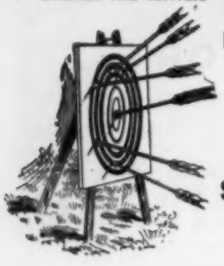

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Lorain Foundry Co., Lorain, O.

Anti-Friction Metal—
C. H. Besly & Co., Chicago, Ill.
North American Metaline Co., Long Island City, N. Y.
Lorain Foundry Co., Lorain, O.
Magnolia Metal Co., New York City.

Babbitt Metal—
C. H. Besly & Co., Chicago, Ill.
Lorain Foundry Co., Lorain, O.

Bar Iron and Steel—
Ætna-Standard Iron & Steel Co., Bridgeport, O.
Bourne-Fuller Co., Cleveland, O.

Barrows—
Akron Cultivator Co., Akron, O.
Lansing Wheelbarrow Co., Lansing, Mich.

Band Saws—
Crescent Machine Co., Leetonia, O.

Belting—
C. H. Besly & Co., Chicago, Ill.
Schultz Belting Co., St Louis, Mo.

Blacksmith and Carriage Supplies—
C. H. Besly & Co., Chicago, Ill.

Blowers—
B. F. Sturtevant Co., Boston, Mass.

Blast Furnace Supplies—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, Ohio.
Sharpsville Foundry and Machine Co., Sharpsville, Pa.

Boilers and Boiler Attachments—
Wm. B. Pollock & Co., Youngstown, O.
Cahall Sales Department, Pittsburg, Pa.
Enterprise Boiler Co., Youngstown, O.
The Edward P. Allis Co., Milwaukee, Wis.
The Hooven, Owens & Rentschler Co.
Fulton Steam Boiler Wks. & Fdy., Richmond Ind.
The Hazelton Boiler Co., New York.
Clonbrock Steam Boiler Co., Brooklyn, N. Y.
Harrison Safety Boiler Works, Philadelphia.
Lane & Bodley Co., Cincinnati, O.
Westinghouse, Church, Kerr & Co., New York City.
Meehan Boiler & Construction Co., Lowellville, Ohio.
Wm. C. Thayer, Cleveland, O.
Walker Bros., Lansing, Mich.
Detroit Screw Works, Detroit, Mich.

Boiler Covering—
C. H. Besly & Co., Chicago, Ill.

Boiler Fronts and Fittings—
The Lane & Bodley Co., Cincinnati, O.

Boiler Tubes—
S. Fix Sons, Cleveland.

Bolts and Bolt Machinery—
Upson Nut Co., Cleveland.

Bolts and Nuts—
Upson Nut Co., Cleveland, O.
W. H. Bosworth, Cleveland, O.

Boring and Turning Mills—
H. Bickford, Lakeport, N. H.

Brass Castings—
Lorain Foundry Co., Lorain, O.
The Lunkenheimer Co., Cincinnati, O.

Brass Work (Special Finished)—
The Lunkenheimer Co., Cincinnati, O.

Brass and Iron Fittings—
W. H. Bosworth, Cleveland, O.
The Lunkenheimer Co., Cincinnati, O.

Bridges—
Shiffler Bridge Co., Pittsburg.

Buildings (Steel Frame.)—
Shiffler Bridge Co., Pittsburg.

Carbon Points—
Jeffrey Mfg. Co., Columbus, O.

Castings—
Lorain Foundry Co., Lorain, O.
Coshocton Foundry Co., Coshocton, O.
Seaman-Sleeth Co., Pittsburg, Pa.
Lane & Bodley Co., Cincinnati, O.
Hooven, Owens & Rentschler Co., Hamilton O.
Fulton Steam Boiler Wks. & Fdy., Richmond, Ind.
W. A. Jones Foundry Co., Chicago, Ill.
Sharpsville Foundry and Machine Co., Sharpsville, Pa.

Castings (Brass)—
Lorain Foundry Co., Lorain, O.
The Lunkenheimer Co., Cincinnati, O.
Sharpsville Foundry and Machine Co., Sharpsville, Pa.

Chain Hoists—
Moore Mfg. Co., Milwaukee, Wis.
Reading Crane & Hoist Works, Reading, Pa.
Burr Mfg. Co., Cleveland, O.

Chain Belting—
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.

Channelers—
The Ingersoll-Sergeant Drill Co., New York.

Charging Barrows—
Akron Cultivator Co., Akron, O.

Chemists—
Dickman & MacKenzie, Chic
F. A. Emmerton, Cleveland, O.
O. Textor, Cleveland, O.
Wm. B. Phillips, Birmingham, Ala.
Wellman Seaver Co., Cleveland, O.

Chilled and Sand Rolls—
The Lloyd Booth Co., Youngstown, O
Wm. Tod & Co., Youngstown, O.
Lorain Foundry Co., Lorain, O.
Seaman, Sleeth Co., Pittsburg, Pa.

Coal Cutters—
The Ingersoll-Sergeant Drill Co., New York.

Coal Screens—
A. J. Beckley & Co., Garwood, N. J.

Coal and Coke—
W. H Bosworth, Cleveland, O.
Forster, Waterbury & Co., Chicago, Ill.
C. K. Pittman, Chicago, Ill.
Pickands, Brown & Co., Chicago, Ill.
Miller, Wagoner & Bentley, Chicago, Ill.
Rogers, Brown & Co., Cincinnati, O.

Coal Mining Machinery—
Jeffrey Mfg. Co., Columbus, O.
H. C. Frick Coke Co., Pittsburg, Pa.

Conveyors—
Jeffrey Mfg. Co., Columbus, O.
Heyl & Patterson, Pittsburg, Pa.
Link-Belt Machinery Co., Chicago, Ill.

Compressed Air Shop Tools—
Clayton Air Compressor Works, New York City.
Rand Drill Co., Chicago, Ill.
Norwalk Iron Wks. Co., South Norwalk, Conn.
The Ingersoll-Sergeant Drill Co., New York.

Corrugated Iron—
Sykes Iron & Steel Roofing Co., Niles, O
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Cranes and Derricks—
Wm. Tod & Co., Youngstown, O.
Marion Steam Shovel Co., Marion, O.
Edwin Harrington, Son & Co., Philadelphia.
Moore Mfg. Co., Cleveland, O.
Wellman-Seaver Engineering Co., Cleveland, O.
Reading Crane & Hoist Works, Reading, Pa.
Case Mfg. Co., Columbus, O.
The Bucyrus Co., South Milwaukee, Wis.

Dies—
Toledo Machine & Tool Co., Toledo, O.
Perkins Machine Co., Boston, Mass.
Walker Bros., Lansing, Mich.

Double Spindle Lathes—
Dietz, Schumacher & Boye, Cincinnati, O.

Dredges—
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.

Drill Presses—
Lodge & Shipley Machine Tool Co., Cincinnati.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.
Fox Machine Co., Grand Rapids, Mich.

Drop Presses—
Toledo Tool & Machine Co., Toledo, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
Perkins Machine Co., Boston, Mass.
Fox Machine Co, Grand Rapids, Mich.

Dry Kilns—
B. F. Sturtevant Co., Boston.

Dynamos—
Westinghouse Electric & Mfg. Co., Pitts
Westinghouse, Church, Kerr & Co., New York City.
Jeffrey Mfg. Co., Columbus, O.
Card Electric Co., Mansfield, O.
Fisher Electrical Mfg. Co., Detroit, Mich.

Eave Troughs and Conductors—
Berger Mfg. Co., Canton, O.

Electrical Supplies—
Westinghouse Electric & Mfg. Co., Pittsburg.
Westinghouse, Church, Kerr & Co., New York City.
Card Electric Co., Mansfield, O.
Automatic Circuit Breaker Co., Newaygo, Mich
Fisher Electrical Mfg. Co., Detroit, Mich.

Elevators—
The Lane & Bodley Co., Cincinnati, O.

Elevating and Conveying Machinery—
Heyl & Patterson, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.

Emery and Corundum Wheels—
J. Wendell Cole, Columbus and Chicago.
Sterling Emery Wheel Mfg. Co., Tiffin, O.

Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
Sterling Emery Wheel Mfg. Co., Tiffin, O.

Engineers and Contractors—
Wellman Seaver Engineering Co., Cleveland, O.
Edward E. Erikson, Pittsburg, Pa.
Westinghouse, Church, Kerr & Co., Pittsburg Pa.
Heyl & Patterson, Pittsburg, Pa.
Meehan Boiler & Construction Co., Lowellville, Ohio.
Sharpsville Foundry and Machine Co., Sharpsville, Pa.

Engineers' Supplies—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
The Lunkenheimer Co., Cincinnati, O.

Engravers and Electrotypers—
Cleveland Electrotype Co., Cleveland, O.
Central Electrotype & Engraving Co., Cleveland, O.
National Engraving Co., Cleveland, O.

Engine Lathes—
Lodge & Shipley Machine Tool Co., Cincinnati, Ohio.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington & Son Co., Philadelphia, Pa.
Dietz Schumacher & Boye Cincinnati, O.

Engine Packing—
C. H. Besly & Co., Chicago, Ill.

Engines (Steam)—
Wm. Tod & Co., Youngstown, O.
B. F. Sturtevant Co., Boston, Mass.
The Edward P. Allis Co., Milwaukee, Wis.
The Hooven, Owens & Rentschler Co.
Lane & Bodley Co. Cincinnati, O.
Westinghouse, Church, Kerr & Co., New York City.
W. H. Bosworth, Cleveland, O.
Wm. C. Thayer, Cleveland, O.
Walker Bros., Lansing, Mich.

Exhaust Heating Apparatus—
B. F. Sturtevant Co., Boston, Mass.

Fans—
B. F. Sturtevant Co., Boston, Mass.
W. H. Bosworth, Cleveland, O.

Feed Water Heaters and Purifiers—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Harrison Safety Boiler Works, Philadelphia, Pa.

Files, Makers of—
C. H. Besly & Co., Chicago, Ill.

Fire Brick and Clay—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Reese, Hammond & Co., Bolivar, Pa.
Clearfield Fire Brick Co., Clearfield, Pa.
Dover Fire Brick Co., Cleveland.
Stuart Fire Brick Co., Pittsburg, Pa.
Diamond Fire Brick Works, Akron, O.

Fire Proof Covering—
C. H. Besly & Co., Chicago, Ill.

Foot and Power Lathes—
Lodge & Shipley Machine Tool Co., Cincinnati
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia, Pa.
Dietz, Schumacher & Boye, Cincinnati, O.

Foundries—
Wm. Tod & Co., Youngstown, O.
Lorain Foundry Co., Lorain, O.
Seaman, Sleeth Co., Pittsburg, Pa.
The Lane & Bodley Co., Cincinnati, O.
Hooven, Owens & Rentschler Co., Hamilton, O
Fulton Steam Boiler Wks. & Fdy., Richmond, Ind.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.

Foundry Supplies—
Clearfield Fire Brick Co., Clearfield, Pa.
Stuart Fire Brick Co., Pittsburg, Pa.
The Ohio Sand Co., Conneaut, O.
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O.
Reese-Hammond & Co., Bolivar, Pa.
Tabor Mfg. Co., Elizabeth, N. J.
Crescent Machine Co., Leetonia, O.

Forgings—
Cleveland City Forge & Iron Co., Cleveland.
Bethlehem Iron Co., South Bethlehem, Pa.

Friction Metal—
Magnolia Metal Co., New York City.

Furnaces—
Brightman Furnace Co., Cleveland, O.
Playford Stoker Co., Cleveland, O.

Furnace Linings—
Union Mining Co., Mt. Savage, Md.

Fuel Oil Burners—
W. S. Rockwell & Co., New York City.

Galvanizers—
Cleveland Galvanizing Works, Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Gas Engines—
Charter Gas Engine Co., Sterling, Ill.
Columbus Machine Co., Columbus, O.

Gear Cutting—
The R. D. Nuttall Co., Allegheny, Pa.

Grindstones—
C. H. Besly & Co., Chicago, Ill.

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Jos. Dixon Crucible Co., Jersey City N. J.,

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W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.

Grip Sockets—
M. L. Andrew & Co., Cincinnati, O.

Hack Saws—
Millers Falls Co., New York City.

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Edwin Harrington Son & Co., Philadelphia.
Moore Mfg. Co., Cleveland, O.
Reading Crane & Hoist Works, Reading, Pa.
The Lane & Bodley Co., Cincinnati, O.
Burr Mfg. Co., Cleveland, O.

Heaters and Purifiers—
Harrison Safety Boiler Works, Philadelphia.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Heating and Ventilating Apparatus—
B. F. Sturtevant Co., Boston.

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C. H. Besly & Co., Chicago, Ill.

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The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Lidgerwood Mfg. Co., New York City.

Hoisting Machinery—
Link Belt Machinery Co., Chicago, Ill.
Reading Crane & Hoist Works, Reading, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
Case Mfg. Co., Columbus, O.
Earl C. Bacon, New York City.
Burr Mfg. Co., Cleveland, O.

Hydraulic Machinery—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Ingot Molds—
Lorain Foundry Co., Lorain, O.

Injectors—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct

Iron Buildings—
Shiffler Bridge Co., Pittsburg, Pa.

Iron Nails and Steel—
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
Cambria Iron Co., Johnstown, Pa.
R. H. Stroud & Co., Chicago, Ill.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.,

PITTSBURG, PA.,

The leading manufacturers of Electrical Apparatus for Electric Lighting, Power Transmission, and Electric Railway Plants.

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32 Victoria St., LONDON, S.W., ENGLAND.

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Iron and Steel Roofing—
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Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Iron Ore—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
Pickands, Brown & Co., Chicago, Ill.
M. A. Hanna & Co., Cleveland, O.
Chas. F. Rand. Prest., New York City.

Iron Working Tools—
Toledo Machine & Tool Co., Toledo, O.
H. Bickford, Lakeport, N. H
Lodge & Shipley Machine Tool Co., Cincinnati.
C. H. Besly & Co., Chicago, Ill.
John Adt & Son, New Haven, Conn.
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Edwin Harrington Son & Co., Philadelphia
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Fox Machine Co., Grand Rapids, Mich.
Wm. C. Thayer, Cleveland, O.
M. L. Andrew & Co., Cincinnati, O.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O
Link-Belt Machinery Co., Chicago, Ill
Heyl & Patterson, Pittsburg, Pa.

Lathes—
Lodge & Shipley Machine Tool Co., Cincinnati
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.
Wm. Glader, Chicago, Ill.

Lubricators—
The Lunkenheimer Co., Cincinnati, O.

Machinists' Tools and Supplies—
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Lodge & Shipley Machine Tool Co., Cincinnati.
Wm. Glader, Chicago, Ill.

Machine Screws—
C. H. Besly & Co., Chicago, Ill.

Machine Shops—
Toledo Machine & Tool Co., Toledo, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.

Machinery and Tool Steel—
W. H. Bosworth, Cleveland, O.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill.

Manufactured Iron & Steel—
Bourne-Fuller & Co., Cleveland, O.
Cleveland Rolling Mill Co., Cleveland, O.
Cambria Iron Co., Johnstown, Pa.
Junction Iron & Steel Co., Mingo Junction, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Metal Bearings—
North American Metaline Co., Long Island City, N. Y.

Metal Stamping—
Oliver P. Clay Co., Cleveland, O.

Milling Machines—
Lodge & Shipley Machine Tool Co., Cincinnati.
U. Baird Machinery Co., Pittsburg, Pa.
Fox Machine Co., Grand Rapids, Mich.

Mining Machinery—
The Bucyrus Co., South Milwaukee, Wis.
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Gates Iron Works, Chicago, Ill.
W. H. Bosworth, Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.

Motors—
Westinghouse, Church, Kerr & Co., New York City.
Westinghouse Electric & Mfg. Co., Pittsburg.
Card Electric Co., Mansfield, O.
Fisher Electrical Mfg. Co., Detroit, Mich.

Molding Machines—
Tabor Mfg. Co., Elizabeth, N. J.

Molding Sand—
Ohio Sand Co., Conneaut, O.

Oilless Bearings—
North American Metaline Co., Long Island, City, N. Y.

Oil Burners—
W. S. Rockwell & Co., New York City.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.

Oil Pumps—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.

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Gates Iron Works, Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.

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Jenkins Bros., New York City.

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Jos. Dixon Crucible Co., Jersey City, N. J.

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Aitchison Perforated Metal Co. Chicago.
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Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co., Chicago, Ill.
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Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill
Miller, Wagoner & Bentley, Chicago, Ill.
Rogers, Brown & Co., Cincinnati, O.
Superior Charcoal Iron Co., Detroit, Mich.

Pipe Covering—
C. H. Besly & Co., Chicago, Ill.

Pipe
W. H. Bosworth, Cleveland, O.

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U. Baird Machinery Co., Pittsburg, Pa.

Plates—
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C. H. Besly & Co., Chicago, Ill.

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Long & Allstattar Co., Hamilton, O.

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The Lane & Bodley Co., Cincinnati, O.

Presses—
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Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
Long & Allstatter Co., Hamilton, O.

Pressure Reducing Valves—
W. H. Bosworth, Cleveland, O.

Pulleys—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.

Pumps (Steam)—
The Edward P. Allis Co., Milwaukee, Wis.
Henry R. Worthington, Brooklyn, N. Y.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
W. H. Bosworth, Cleveland, O.

Punches—
Walker Bros., Lansing, Mich.

Pyrometers—
Edward Brown, Philadelphia, Pa.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland.

Riveting Machinery—
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Rock Drills—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

Rolling Mill Machinery—
The Lloyd Booth Co., Youngstown, O.

Roofs—
Shiffler Bridge Co., Pittsburg.

Safety Lift Blocks—
Burr Mfg. Co., Cleveland, O.

Sand and Chill Rolls—
The Lloyd Booth Co., Youngstown, O.
Lorain Foundry Co., Lorain, O.
Seaman, Sleeth Co., Pittsburg, Pa.

Saws—
Peter Gerlach & Co., Cleveland.

Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.

Screws—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill.

Semi-Steel—
The King & Andrews Co., Chicago, Ill.

Shafting—
The Lane & Bodley Co., Cincinnati, O.

Shearing and Punching Machinery—
Bertsch & Co., Cambridge City Ind.
Toledo Machine & Tool Co., Toledo, O.
Long & Allstatter Co., Hamilton, O.
Fox Machine Co., Grand Rapids, Mich.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland.
Ætna-Standard Iron & Steel Co., Bridgeport, O
E. H. Stroud & Co., Chicago, Ill.

Special Machinery—
Toledo Machine & Tool Co., Toledo, O
Edwin Harrington Son & Co., Philadelphia.
Perkins Machine Co., Boston, Mass.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago Ill

Steam Packing—
C. H. Besly & Co., Chicago, Ill.

Steam Shovels and Dredges—
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.

Steam Specialties—
C. H. Besly & Co., Chicago, Ill.

Steel—
Otis Steel Co., Cleveland, O.
Miller, Wagoner & Bentley, Chicago, Ill.
E. H. Stroud & Co., Chicago, Ill.

Steel Castings—
W. H. Bosworth, Cleveland, O.
The King & Andrews Co., Chicago, Ill.
Otis Steel Co., Cleveland, O.

Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland
Bethlehem Iron Co., South Bethlehem,
Cambria Iron Co., Johnstown, Pa.

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland.

Stokers—
Playford Stoker Co., Cleveland, O.
Brightman Furnace Co., Cleveland, O.
Westinghouse, Church, Kerr & Co., New York City.

Tackle Blocks—
Burr Mfg. Co., Cleveland, O.

Tanks—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, Ohio.

Tinning Machinery—
W. H. Bosworth, Cleveland, O.
The Lloyd Booth Co., Youngstown, O.

Tin Plate—
Ætna-Standard Iron & Steel Co., Bridgeport, O

Tin and Terne Plates—
B. P. Crane & Co., Chicago, Ill
E. H. Stroud & Co., Chicago, Ill.

Tool Steel—
C. H. Besly & Co., Chicago, Ill.

Transmission Machinery—
Link-Belt Machinery Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
Jeffrey Mfg. Co., Columbus, O.

Tube Welding—
S. Fix Sons, Cleveland.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.
W. H. Bosworth, Cleveland, O.

Twist Drills—
C. H. Besly & Co., Chicago, Ill.

Valves—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
The Lunkenheimer Co., Cincinnati, O.

Ventilating Fans—
B. F. Sturtevant Co., Boston Mass.

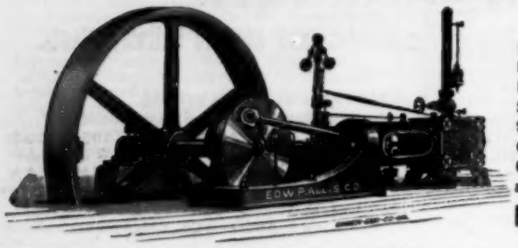
Wheelbarrows—
Akron Cultivator Co., Akron, O.
Lansing Wheelbarrow Co., Lansing, Mich.

Wire Machinery—
John Adt & Son New Haven Conn.
Wm. Glader, Chicago, Ill.

Wire Nail Machinery—
Wm. Glader, Chicago, Ill.

THE EDWARD P. ALLIS COMPANY

MILWAUKEE, WIS.



MANUFACTURERS OF

ICE and REFRIGERATING MACHINERY, Blowing Engines, Hoisting Engines, Pumping Engines Air Compressors, Special Engines for Electric Lighting Street Railways and Rolling Mills. Ore Crushers, Crushing Rolls, Stamp Mills Concentrators, General Mining Milling and Smelting Machinery.

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Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

	PAGE
Adt & Son, John	27
Ætna-Standard Iron & Steel Co	26
Aitchison, Rob't Perforated Metal Co	31
Akron Cultivator Co	31
Allis & Co., Edward P	30
Andrew & Co., M. L	20
Apollo Iron & Steel Co	1
Automatic Circuit Breaker Co	25
Bacon, Earle C	27
Baird Machinery Co	20
Beckley & Co., A. J	26
B. & O. R. R	22
Besly & Co., C. H	36
Bethlehem Iron Co	35
*Berger Mfg. Co	—
*Bertsch & Co	—
Bickford, H	36
Booth Co., The Lloyd	34
Bosworth W. H	27
Bourne-Fuller Co	26
Brightman Furnace Co	32
*Brown, Edward	22
Bucyrus Steam Shovel & Dredge Co	24
Burr Mfg. Co	21
Cahall Sales Department	1
Cambria Iron Co	26
Card Electric Co	35
Case Mfg. Co	1
Central Electrotype & Engraving Co	2
Charter Gas Engine Co	36
Chicago & Northwestern Ry	33
Chicago Screw Co	1
Clayton Air Compressor Works	2
Clay Co., Oliver P	1
Clearfield Fire Brick Co	35
Cleveland & Buffalo Transit Co	33
Cleveland City Forge & Iron Co	1
Cleveland Electrotype Co	35
*Cleveland Galvanizing Works	—
Cleveland Rolling Mill Co	26
Clinton Iron & Steel Co	26
*Clonbrock Steam Boiler Co	—
*C. M. & St. P. Ry	—
Cole, J. Wendell	36
Columbus Machine Co	23
Crane & Co., B. P	35
Crescent Machine Co	19
Detroit & Cleveland Steam Navigation Co	33
Detroit Screw Works	—
*Diamond Fire Brick Works	20
Dickman & MacKenzie	1
Dixon, Jos. Crucible Co	32
Dover Fire Brick Co	35
Emmerton, F. A	2
Enterprise Boiler Co	1
Erikson, Edward E	33
*Fix Sons	—
Fisher Electrical Mfg. Co	21
Fleharty, J. H. & Co	2
Forster, Waterbury & Co	1
Fox Machine Co	36
Frick Coke Co., H. C	1
†Fulton Steam Boiler Wks. & Fdy. Co	—
Gates Iron Works	2
Gerlach, Peter & Co	35
Glader, Wm	2
Gobeille Pattern Co	31
Hanna & Co., M. A	26
Harrington & King Perforating Co	36
Harrington, Son & Co., Edwin	36
Harrison Safety Boiler Works	18
Hartford Steam Boiler Insp. & Ins. Co	35
Hazelton Boiler Co	23
Heyl & Patterson	24
Hooven, Owens & Rentschler Co	25
Illinois Central R. R	21
Ingersoll-Sergeant Drill Co	2
Iron Clad Paint Co	31
Jeffrey Mfg. Co	23
Jenkins Bros	31
Jones Foundry Co., W. A	1
King & Andrews Co	19
Lane & Bodley	32
Lansing Wheelbarrow Co	31
Lake Superior Consolidated Iron Mines	26
Lidgerwood Mfg Co	19
Link-Belt Machinery Co	21
*Lodge & Shipley Machine Tool Co	22
Long & Allstatter Co	20
Lorain Foundry Co	1
Lunkenheimer Co., The	34
Magnolia Metal Co	1
Marine Iron Works	20
Marion Steam Shovel Co	35
Meehan Boiler & Construction Co	36
Miller, Wagoner & Bentley	2
Millers Falls Co	36
Moore Mfg. Co	1
National Engraving Co	35
North American Metaline Co	36
Norwalk Iron Works Co	2
Nuttall Co. The R. D	25
Oglebay, Norton & Co	26
†Ohio Sand Co	—
Otis Steel Co	19
Phillips Testing Laboratory	23
Pickands, Brown & Co	2
Pittman, C. K	2
Pollock, Wm. B. & Co	2
Playford Stoker Co	34
Rand Drill Co	2
Rand, Chas. F., Prest	26
Reading Crane & Hoist Works	21
Reese, Hammond & Co	36
Rockwell & Co., W. S	32
Rogers, Brown & Co	36
Seaman, Sleeth Co	26
‖Sharon Fire Brick Works	1
Sharpsville Foundry and Machine Co	22
Shiffler Bridge Co	26
Shultz Belting Co	1
Sterling Emery Wheel Mfg. Co	33
Stilwell-Bierce & Smith-Vaile Co	2
Stroud & Co., E. H	2
Stuart Fire Brick Co	32
Sturtevant Co., B. F	1-24
Superior Charcoal Iron Co	27
Sykes Iron & Steel Roofing Co	34
Tabor Mfg Co	23
Textor, O	2
Tod, Wm. & Co	34
Toledo Machine & Tool Co	35
Thayer Wm. C	27
Union Mining Co	19
Upson Nut Co	1
Walker Bros	21
Westinghouse Electric & Mfg. Co	22
Westinghouse, Church, Kerr & Co	23
Wormer Machinery Co	27
Worthington, Henry R	32
Wellman Seaver Engineering Co	36

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

Special low-phosphorus hard Ore, Bessemer	$3.40@3.46
No. 1 Specular, Bessemer	3.05@3.17
No. 1 Bessemer hematite	2.60@2.90
Hematites No. 1 non-Bessemer	2.00@2.25
No 1. Specular, non-Bessemer	2.40@2.60

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$ @10 15
No. 1 Strong Foundry	10 05@10 90
No. 2 Strong Foundry	10 15@10 40
Gray Forge, red short	9 15
Gray Forge, neutral	9 40
No. 1 American Scotch	10 75@11 00
No. 2 American Scotch	10 25@10 50
Lake Superior Charcoal	@12 00
PITTSBURG:	
No. 1 Foundry	$10 75@10 90
No. 2 Foundry	10 25@10 40
Gray Forge	9 25@9 40
White and Mottled	9 50
Warm Blast Charcoal	13 00@13 50
Cold Blast Charcoal	16 00
Bessemer	9 50
CHICAGO:	
Lake Superior Charcoal	$12 50@$13 00
Local Coke Foundry No. 1	11 00@11 50
Local Coke Foundry No. 2	10 50@11 00
Local Coke Foundry No. 3	10 25@10 50
Local Scotch Foundry No. 1	11 50@12 00
Local Scotch Foundry No. 2	11 00@11 50
Local Scotch Foundry No. 3	10 50@11 00
Southern Coke No. 1	11 00@11 25
Southern Coke No. 2	10 60@10 85
Southern Coke No. 3	10 35@10 60
Southern No. 1 Soft	11 00@11 25
Southern No. 2 Soft	10 60@10 85
Southern Silveries	11 25@11 50
Jackson Co. Silveries	12 50@14 50
Ohio Silveries No. 1	@
Ohio Strong Softeners	12 00@12 25
Alabama Car Wheel	16 00@17 00
Malleable Bessemer	10 75@11 00
Coke Bessemer	11 50@12 00
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$ 10 00
Southern Coke No. 2 and No. 1 Soft	9 75
Hanging Rock Coke, No 1	9 45
Hanging Rock Charcoal No. 1, Fdy	14 50@15 50
Tennessee Charcoal No 1	12 50@13 00
Jackson County Silvery No 1	12 50@13 00
Southern Coke, Gray Forge	9 25
" " Mottled	9 00
Standard Georgia Car Wheel	14 25@15 00
Tennessee " "	13 00@14 00
Lake Superior " "	14 25@14 50
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	11 25
No. 2 Foundry Strong Coke Iron Lake Superior Ore	10 75
Ohio Strong Softener No. 1	11 75
Jackson Co. Silvery No. 1	14 00
Lake Superior Charcoal	15 50
Southern Soft No. 1	11 75
Hanging Rock Charcoal	17 00
ST. LOUIS:	
Southern Coke No 1	$10 50@$10 75
Southern Coke No. 2	10 25
Southern Coke No. 3	9 75@10 00
Southern Gray Forge	9 75
Southern Charcoal No. 1	12 50
Missouri Bessemer	12 00
Ohio Softeners	14 00
Lake Superior Car Wheel	13 50
Southern Car Wheel	13 25

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	GROSS TONS
Old iron rails	$14 00
Old steel rails (6 ft. and over)	10 50
Old steel rails (6 ft. and under)	10 00
Old car wheels	11 00
	NET TONS
No. 1 R. R. wrought scrap	$11 50
Mill scrap	8 50
No. 1 Machine cast scrap	8 00
Iron axles	15 00
Axle turnings	8 00
Wrought turnings (free from cast)	6 50
Cast borings	5 25
Uncut wrought iron boilers	3 50
Steel boiler plates	8 00
Grate bars	5 25
Pipes and flues (clean)	7 50
Tank iron	7 00
Hoop and band iron	6 50
Sheet iron	5 00
Wrought drillings	6 00
Malleable iron	8 50

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland)	1.15c
Angles	1.10c
Tees	1.25c
Universal Plates	1.15@1.20c
Sheared Plates	1.20c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1⅞	1.10 Base.
2 to 2⅞	.20 extra.
3 to 3½	.50 "
3¾ to 4	.80 "
4¼ to 4½	1.00 "
4¾ to 5	1.30 "
5¼ to 6	1.80 "
6¼ to 6½	2.20 "

6⅝ to 7¾	2.50 extra.
¾ to ⅞	.10 "
⅝ to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 11-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1½ to 4 x ⅜ to 1	1.05 Base.
4½ to 6 x ⅜ to 1	.10 extra
6¼ to 8 x ⅜ to 1	.60 "
8¼ to 10 x ⅜ to 1	.80 "
1⅜ to 4 x 1 1-16 to 1½	.30 "
4½ to 6 x 1 1-16 to 1½	.40 "
6¼ to 8 x 1 1-16 to 1½	.60 "
8¼ to 10 x 1 1-16 to 1½	.90 "
2 to 4 x 1⅜ to 2	.50 "
4¼ to 6 x 1⅜ to 2	.60 "
6¼ to 8 x 1⅜ to 2	.80 "
8¼ to 10 x 1⅜ to 2	1.00 "
2 to 4 x 2⅜ to 3	.60 "
4¼ to 6 x 2⅜ to 3	.80 "
6¼ to 8 x 2⅜ to 3	1.00 "
1⅜ to 1¾ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅞	.20 "
¾ to 15-16 x ⅜ to ¾	.40 "
⅝ to 11-16 x ⅜ to ⅝	.50 "
½ to 9-16 x ⅜ to ½	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1½ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
¾ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
½ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

to 8 x No. 9 to 3-16	.90 extra.
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1½ to 4 x No. 9 to 3-16	.40 "
1½ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "
7-16 to ½ x No. 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1.40
⅜ x No. 9 to 3-16	1.50
⅜ x Nos. 10, 11 and 12	1.60

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅞ to 1½	.40 extra.
¾ to 13-16	.50 "
⅝ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
½ to 9-16 x 3-16	1.00 "
⅝ to 11-16 x ½	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra.
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4.50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes .1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.		
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50	Base.
		Extras.	
1½ to 6,	" 10, 11, 12 or 1/16"	.05	per 100 lbs.
1 to 1½,	" 7, 8, 9 or 3-16"	.20	"
1 to 1½,	" 10, 11, 12 or 1/16"	.15	"
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20	"
13-16 and ⅞,	" 10, 11, 12 or 1/16"	.25	"
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30	"
11-16 and ¾,	" 10, 11, 12 or 1/16"	.35	"
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40	"
9-16 and ⅝,	" 10, 11, 12 or 1/16"	.45	"
½,	Nos. 7, 8, 9 or 3-16"	.55	"
½,	" 10, 11, 12 or 1/16"	.60	"
7-16	" 7, 8, 9 or 3-16"	.75	"
7-19	" 10, 11, 12 or 1/16"	.85	"
⅜,	" 7, 8, 9 or 3-16"	.95	"
⅜,	" 10, 11, 12 or 1/16"	1.05	"

Iron and Steel Hoops.

Width in Inches.	English Standard Gauge.		
1 7-16 to 3	Nos. 13, 14, 15 and 16	1.60	Base.
		Extras	
1 7-16 to 2,	" 17, 18, and 19	.05	per 100 lbs.
1 7-16 to 2,	" 20	.10	"
1 7-16 to 2,	" 21	.15	"
1 -16 to 1¾,	" 22	.25	"
1 1/16 to 1¾,	" 13, 14 and 15	.05	"
1 ⅛ 1¾,	" 16, 17 and 18	.10	"

PERFORATED METALS

OF ALL KINDS FOR

MILLING, MINING AND AGRICULTURAL MACHINERY.

Perforated Iron, Steel, Copper, Brass, Tin, Zinc, Lead, Etc., to Order.
Large and Varied Assortment of Sizes. Correspondence Solicited.

THE ROBERT AITCHISON PERFORATED METAL CO.,

Office, Room 510, 265 to 269 Dearborn St., CHICAGO, ILL. Works, So. Chicago.

We Claim The Following Merits for Jenkins Bros.' Valves

1 Manufactured of the best Steam Metal.
2. No regrinding, therefore not constantly wearing out the Seat of the Valves.
3. Contain JENKINS DISC, which is suitable for all Pressures of Steam, Oil and Acids.
4. The Easiest Repaired, and all parts Interchangeable.
5. Every Valve Tested before leaving the factory.
6. ALL GENUINE stamped with Trade Mark,

JENKINS BROTHERS, NEW YORK, PHILADELPHIA, CHICAGO, BOSTON.

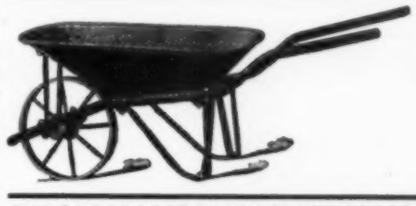
Akron Tubular Steel Wheelbarrows.

RE-INFORCED TRAYS.
SOLID FRAME.
NO HOLES DRILLED INTO IT.
ALL PARTS CLAMPED ON.

Perfect Forward Dump.
Strongest, Easiest Handled.
Lightest and Most Durable.

McNEIL'S PATENT BALANCED AUTOMATIC DUMP CHARGING BARROW.

The Akron Cultivator Co.,
MANUFACTURERS, Akron, Ohio.



TUBULAR STEEL BARROWS.

Special hand-made pig iron barrows.

WHEELBARROW CARS AND TRUCKS

WRITE FOR CATALOGUE.

LANSING WHEELBARROW CO.,
Lansing Mich.

Don't Waste Money in Your Pattern Shop.

THE GOBEILLE PATTERN CO., Cleveland.

Not every insertion of every advertiser's card brings an order for the advertiser's good; no more does every visit of the traveling salesman result in a sale.

There is a vast deal in familiarity with the type and phrase in which a manufacturer makes himself known to the advertisement reader, just as the personal acquaintance of his traveling salesman gets him a hearing when a strange face and a strange voice are bowed out with a "busy day's" courtesies.

The best advertisers, the most successful advertisers, the advertisers who get returns, are those who keep everlastingly at it.

This is a case in which familiarity breeds business.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE

Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

WORTHINGTON STEAM PUMPS

HENRY R. WORTHINGTON,

NEW YORK.

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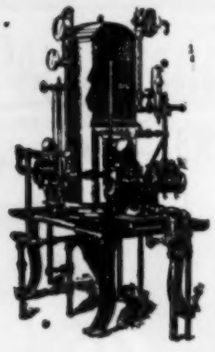

IMPROVED DUPLEX SYSTEM

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BURNING FUEL OIL.

Heats and cleans the oil and delivers it to the fires under high and uniform pressure.

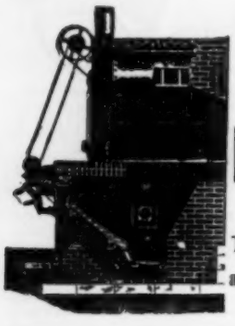
Entirely automatic, most scientific, sensible and economical method of burning oil in existence. If you are operating a Steel Works, Brass or Copper Rolling Mill, Malleable Iron Works, Bolt and Nut Works, Bicycle Works, or do Annealing, Forging, Brazing, Tempering, Japanning, Enameling, Case Hardening, you can use this machine to your advantage.

WE BUILD FURNACES OF ALL KINDS. SATISFACTION GUARANTEED.

W. S. ROCKWELL & CO.,

26 CORTLANDT STREET, NEW YORK.

H. H. CAMPBELL.



Brightman Furnace Co.

648 Broadway, CLEVELAND, O.

SOLE MANUFACTURERS OF THE

Brightman Mechanical Stoker

FOR STEAM BOILERS.

THE MOST ECONOMICAL IN FUEL

and the Best Device in the World for Preventing Smoke.

Send for Catalogue "A."

STUART FIRE BRICK CO.

MANUFACTURERS OF

Silica Brick

For Open-Hearth, Basic and Acid Steel Furnaces, Glass and Copper Tank Furnaces. Extra Shapes MADE TO ORDER.

Office, Room 21, Conestoga Bldg., Cor. Wood and Water Sts., PITTSBURG, PA.

Dixon's Pure Flake Graphite

Is a Blessing to Every Engine Room and Machine Shop.

A small quantity added to any Oil or Grease largely increases its lubricating value and makes the finest Cooling Mixture.

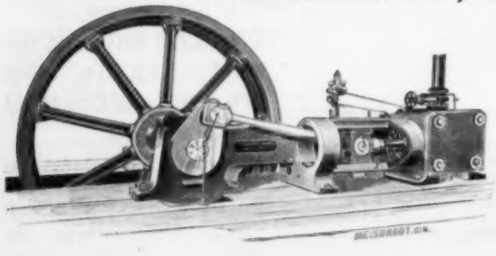
Pamphlet and Sample Sent Free.

JOS. DIXON CRUCIBLE CO., Jersey City, N. J.

Subscribe for The IRON TRADE REVIEW, $3 per year.

THE LANE & BODLEY CO.,

CINCINNATI, OHIO.



Engines,

ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pulleys.

Belt Elevators, Saw Mills.

1⅛ to 1⅜,	" 19 and 20	.15 per 100 lbs.
1⅛ to 1⅜,	" 21	.20 "
1⅛ to 1⅜,	" 22	.30 "
15-16 and 1,	" 13, 14 and 15	.10 "
15-16 and 1,	" 16, 17 and 18	.15 "
15-16 and 1,	" 19 and 20	.20 "
15-16 and 1,	" 21	.25 "
15-16 and 1,	" 22	.35 "
⅞,	Nos. 13, 14 and 15	.20 "
⅞,	" 16, 17 and 18	.25 "
⅞,	" 19 and 20	.30 "
⅞,	" 21	.35 "
⅞,	" 22	.45 "
¾ and 13-16	Nos. 13, 14 and 15	.30 "
¾ and 13-16	" 16, 17 and 18	.35 "
¾ and 13-16	" 19 and 20	.40 "
¾ and 13-16	" 21	.45 "
¾ and 13-16	" 22	.50 "
¾ and 13-16	" 23	.60 "
11-16,	Nos. 13, 14 and 15	.35 "
11-16,	" 16, 17 and 18	.40 "
11-16,	" 19 and 20	.50 "
11-16,	" 21	.60 "
11-16,	" 22	.70 "
11-16,	" 23	.80 "
⅝,	Nos. 13, 14 and 15	.40 "
⅝,	" 16, 17 and 18	.45 "
⅝,	" 19 and 20	.55 "
⅝,	" 21	.65 "
⅝,	" 22	.75 "
⅝,	" 23	.85 "
9-16,	" 13, 14 and 15	.45 "
9-16,	" 16, 17 and 18	.50 "
9-16,	" 19 and 20	.60 "
9-16,	" 21	.70 "
9-16,	" 22	.80 "
9-16,	" 23	.90 "
½,	" 13, 14 and 15	.55 "
½,	" 16, 17 and 18	.60 "
½,	" 19 and 20	.70 "
½,	" 21	.80 "
½,	" 22	.90 "
½,	" 23	1.00 "
7-16,	" 13, 14 and 15	.80 "
7-16,	" 16, 17 and 18	.90 "
7-16,	" 19 and 20	1.00 "
⅜,	" 13, 14 and 15	1.00 "
⅜,	" 16, 17 and 18	1.10 "
⅜,	" 19 and 20	1.20 "

Sheet Iron.

No. 10	1 50
No. 12	1 70
No. 14	1 60
No. 15-17	1 75
No. 18	1 85
No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 55
Marine Flange	1 60
Fire Box	2 05

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special.

Flats. cts. lbs.

2 to 9-16 in. wide by 2 to ⅝ thick	.08

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 40
Open-hearth Tire	"	1 45
Open-hearth Spring	"	1 80
Sleigh Shoe	"	1 45
Toe Calk	"	1 90
Cutter Shoes, tapered and bent	"	1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON. cts. lbs.

1 to 2 in. inclusive	.08
9-16 to ½ in. "	.08
7-16 to ⅜ and 2⅜ to 3 in	.09
3⅛ to 4 in	.09½
⅝ to 11-16 and 4⅛	.10
⅝ to 6 in	.10½
¾ to 9-32 and 6¼ to 7 in	.11
1 in	.13

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 co
Bridge ½, ⅝, 11-16 and ¾ inch diam	3 55

Wrought Pipe and Boiler Tubes.

Lap weld black, base, and 10 per cent				.78
Butt " "	"	"		.72
Lap " galv.	"	"		.70
Butt " "	"	"		.67
Boiler tubes 2¼" and smaller				.72½
Boiler tubes 2½" and larger				.75
Casting screw and socket joint				dis. 50
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	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Rivets.

Iron, Thousand, list November 1, 1894.....dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894.....dis 60@65
Copper.....dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list.....dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 55
Pulley Taps.....dis 40

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 35

Wire.

New List, Apr. 9, 1894

Brass.....dis 35
Copper.....dis 35C
Bright and annealed, Nos. 0@18.....dis 70&10@75
" " Nos. 19@26.....dis 75@75& 5
" " Nos. 27@36.....dis 75&10& 5
Coppered Nos. 0 to 18, market list.....dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis65& 5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....95C ℔ dis 30

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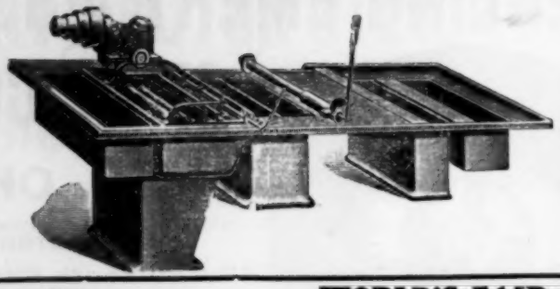

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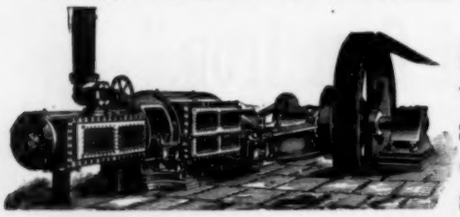

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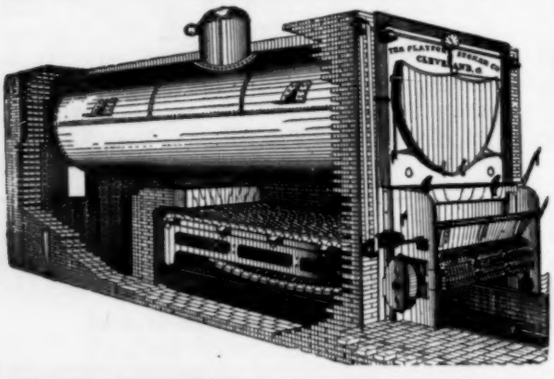

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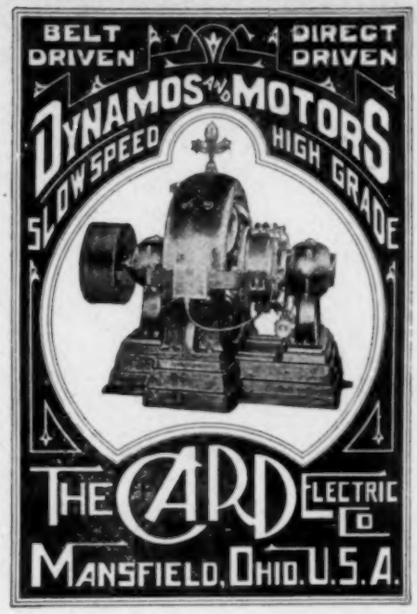

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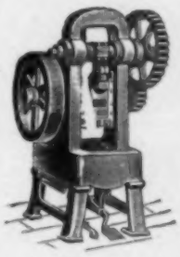
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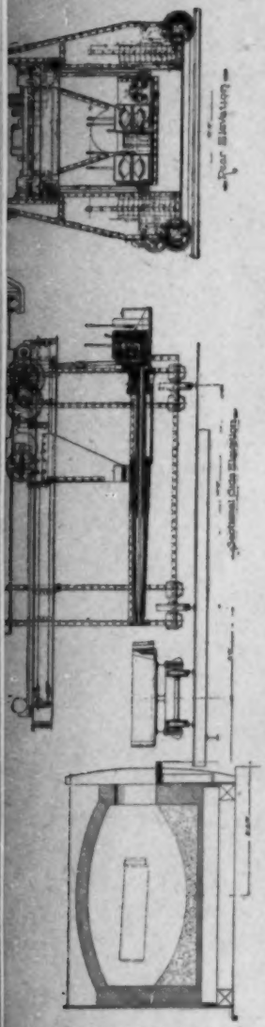

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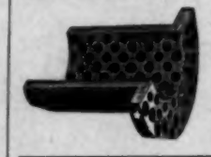

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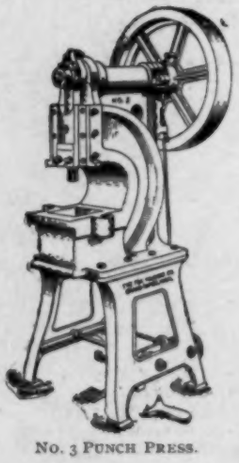

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